Financial Audit the era of Big Data: new possibilities for evaluating and responding to risks in financial statements of the Federal Government

Gledson Pompeu Corrêa da Costa
is a civil servant of the Federal Court of Accounts - Brazil.

Tiago Alves de Gouveia Lins Dutra
is a civil servant of the Federal Court of Accounts - Brazil.

SUMMARY

This study analyzes the possible implications of the Big Data era when performing audits of Federal Government financial statements. Financial audit is characterized as a work of assurance and certification. This type of audit is usually carried out annually, based on aggregated data and limited by approaches based on risks, materiality cuts, and statistical samples. In contrast, the practices of Audit Analytics and Continuous Audit allow financial information of the entities to be analyzed in an integral way and with shorter periodicity, contributing to form timely and more reliable opinions regarding the status of the audited entities. Finally, this paper presents data on the information systems that keep the financial records of the Federal Accounting System and makes considerations on the potential contributions of the new audit practices supported by information technology, aiming at improving financial audit activities within the Federal Court of Accounts – Brazil (TCU) and other oversight institutions.

Keywords: financial audit, continuous audit, Big Data; Audit Analytics.

1. INTRODUCTION

If financial audit were compared to a game between the auditee and the auditor, it would be possible

to say that the auditee always starts out winning. The reasoning is simple: it is the auditor's responsibility to provide **reasonable assurance** that there is no error or fraud in the financial statements. Therefore, it is his/her responsibility to determine if there are relevant distortions that could compromise the content. If the auditor cannot find it, he/she will have to issue an opinion with no reservations and, therefore, certify the quality of the information contained therein.

However, auditing is not a game and, in thesis, the objectives of the auditor and auditee should be the same: give the maximum **transparency** and **credibility** to financial information, thus enabling better decision making and more efficient and effective allocation of resources. Even so, one cannot disregard the possibility of an auditor issuing an opinion saying that the statements are reliable when actually they are not. This is called **audit risk**, which takes on new proportions in face of the speedy development of information technology (IT).

The technological advances have greatly increased the ability of individuals and organizations to produce and exchange information. As a result, we can say that we live in the **Big Data era**: an increasing amount of information that is generated in a frantic rhythm and in different formats, requiring innovative and economic ways of processing in order to support decision- making and process automation (BUYTENDIJK, 2014). In this context, the traditional mechanisms for communicating results, such as annual statements, compete with financial information that is disseminated on the internet and other means. Many times, this happens almost simultaneously with the occurrence of the respective transactions. This favors quicker decision-making and contributes to make operation of economy and governments more dynamic.

Almost unrestricted access to information contributes to the creation of a **risk society**, an expression used by sociologists Anthony Giddens (1999) and Ulrich Beck (1992) to show the changes in social behavior resulting from greater awareness of the risks they are exposed to. Thus, if on one hand increase in the amount, speed and variety of information favors more timely decisions, on the other, greater awareness of the risks increases caution in the decision-making process demanding information that is more and more reliable. An analytical view of the past is no longer enough; it is necessary to develop a predictive ability regarding future events in order to make decisions in the present (DELOITTE, 2013).

Accounting and IT are developing in order to make this new paradigm of financial transparency and accountability, both in the private and public sectors. However, **information is not useful if it is not reliable**. Therefore, it is imperative to modernize the processes of risk evaluation and information reliability assurance, as well as to execute such processes in shorter intervals of time, without reducing the quality of the audit procedures. As online information is made avail-

able each time closer to the date of the event it refers to, **continuous audit** presents itself as a systematic process to obtain electronic evidence capable of providing a **reasonable** basis to issue an opinion regarding the correct presentation of financial statements, practically in real time. (REZAEE *et. al.*, 2001).

Thus, the present study attempts to evaluate how analytical and continuous approaches contribute to the results of financial audit in the Big Data era. To achieve this, the main concepts related to the topic are described and the challenges and opportunities regarding their application to Federal Government financial statements are analyzed. At the end of the study, we propose a reflection on the potential of these new approaches to increase efficacy and efficiency of financial audit within the scope of the Federal Court of Accounts – Brazil (TCU).

2. ASSURANCE, CERTIFICATION AND FINANCIAL AUDIT

The word audit comes from the Latin word *audire*, which means "to listen" (COSTA, 2010). In a direct meaning, one can imagine a meeting of the auditor with the auditee to ask questions and "listen to" explanations regarding the functioning and problems of the audited entity. However, the scarce time of those involved and the large amount of data available have directed the audits towards more complex approaches, in which information does not need to be requested from the auditee if it can be obtained from other sources.

The essence of the concept is maintained regardless of the type of audit: we seek to know the real situation (object) in order to compare it to a desired situation (criterion). Thus, what changes between one and another type is the object – entities, contracts, programs – and the objective – to check reliability, compliance or performance. In the case of financial audit, we attempt to check the reliability of the information contained in the annual statements. In this case, the adjective "financial" is used in a broad sense to portray financial management in general and covers the areas of budget, treasury (financial in a strict sense), accounting and asset-related.

The role of financial audit in the governance structure of public institutions is established in International standards for government audit issued by the International Organization of Supreme Audit Institutions (INTOSAI). According to ISSAI 100, **financial audit is a work of assurance and also of certification** (INTOSAI, 2013). These two concepts are important in order to understand why this kind of audit should be based on risk, should use sampling and issue a timely opinion.

As for the concept of **assurance**, the central idea is that the role of a government auditor is to assure the level of proximity between a real and a desired situation. Thus, the greater the trust regarding this diagnosis, the greater the safety of the decision –making process. Nevertheless, the mentioned standard makes it clear that it is not possible to offer absolute safety and, thus, explains that there are two types of assurance: reasonable and limited.

> Reasonable assurance is high but not absolute. The audit conclusion is expressed in a positive way, conveying that, in the auditor's opinion, the subject matter is or is not in compliance, in all material respects, or, when it is the case, that the information regarding the object provides a fair view, with the applicable criteria.
>
> When giving limited assurance, the audit conclusion states that, based on the procedures carried out, nothing has come to the auditor's attention to cause him/her to believe that the subject matter is not compliant with the criteria. (INTOSAI, 2013)

In the case of financial audit, the two levels of assurance are largely used. Generally, the audits of annual financial statements are of reasonable assurance, while audits of semiannual or quarterly statements have only limited assurance. This is justified due to operational and financial reasons. Many tests in a short period would be necessary and, in view of this, the cost of audits could increase a lot in case financial statements with smaller intervals were awarded positive opinions assuring the reliability of their figures.

Still according to ISSAI 100, there are two types of audit work related to the concept of **certification**: assurance engagements and direct reporting engagements.

In **assurance engagements**, the responsible party measures the subject matter according to the criteria and gives information on the subject. The auditor then obtains enough appropriate audit evidence on the subject matter to provide a reasonable basis for expressing a conclusion.

In **direct reporting engagements**, the auditor is the one who measures or assesses the subject matter according to the criteria. The auditor selects the subject matter and the criteria, taking into consideration risk and materiality. The result of the measurement of the subject matter according to the criteria is presented in

the audit report as findings, conclusions, recommendations, and an opinion (INTOSAI, 2013).

This differentiation is important in order to understand the peculiarities of the objective and of the financial audit process since, according to ISSAI 100, financial audits are always assurance engagements because they are based on financial information presented by the audited entity (responsible party). Therefore, the auditor must assure the financial situation and results of the audited entity (the subject matter), based on a set of financial statements produced by the entity itself (the information on the subject matter).

Translating the normative references into more practical language, during the year there may be many transactions that will have an effect on the financial situation and result of an entity and that are organized according to accounting rules and consolidated into a summarized set of financial statements. The auditor should ensure to the user of such statements that they are reliable. However, it would not be feasible to certify, in a timely fashion, that all the transactions and accounting balances are correctly registered. That is why we work with the aggregate level of an accounting entity, in elastic periodicities, and use mechanisms such as risk-based approach, materiality cuts and statistical sampling to limit the scope of the tests and, in the end, make it possible to achieve cost-benefit in the financial audit works.

The **accounting entity** level establishes the criterion to consolidate information (by department, sector, enterprise, etc.) according to the needs of the users of the information, to the laws, the governance structure and the accountability model, as well as to the interests of investors and creditors. There is an attempt to identify a point of balance that will make it possible to prepare general purpose statements that have enough information on allocation of assets and resources that enable analysis of the financial situation (assets minus liabilities) and of the results (income minus expenses) by all interested parties.

Annual **periodicity** is practically a natural consequence of the International standard of preparing financial statements in this same period, since there is some expectation from external parties that the statements be published together with the audit opinion. Thus, when analyzing the situation of the entity, the statements users consult the auditor's opinion to see if there are any distortions that may affect the credibility of the information.

Among the mentioned mechanisms used to limit the scope of the audit, the risk-based approach directs the work towards accounts that have high levels of Relevant Distortion Risks, established based on the combination of inherent risk and risks resulting from internal control deficiencies. From there, the auditor establishes the audit approach which best responds to residual risks, choosing control tests, detailed tests and analytical procedures to be carried out. The later have increasing importance in the financial audit approach (COSTA, 2007).

In turn, the **materiality** cut reduces the scope of audit Works based on criteria that determine the minimum threshold from which one considers that amounts are relevant enough to affect the general view of the financial situation and results of an entity. In financial audit, materiality is a synonym of relevance, except in a situation of fraud and high level of sensitivity to the activities of the entity.

The third mechanism refers to **sampling**, that can be carried out based on statistics or not. However, due to systemic crises and financial scandals, auditing has become a work that is more and more scientific and statistical approach a necessity for auditors to be able to test only one sample of transactions and extend their conclusions to the whole population.

In traditional financial audit approaches, the mechanisms mentioned are essential in order for the auditor to be able to reach conclusions and issue an opinion in a short period of time regarding a large number of financial transactions.

3. AUDITING IN THE BIG DATA ERA: AUDIT ANALYTICS AND CONTINUOUS AUDIT

More than a mere technological trend, it can be said that the Big Data era is paving the way for new methods of understanding the world and the business decision-making process (ISACA, 2013). From the technical point of view, Big Data refers to sets of data whose **size**, **diversity** of format and generation **speed** surpass the processing capabilities of traditional IT infrastructures (IIA, 2013), which is a challenge to be overcome. On the other hand, from the business viewpoint, a great opportunity arises: the possibility of discovering behavior patterns, co-relation between events and other useful information in order to make decisions that would not be available if this amount and variety of data were not analyzed in a timely fashion.

Thus, a new discipline gains emphasis: Big Data Analytics. It can be defined as the application of statistical methods and other analytical techniques to trans-

action data, financial information and different sources of data that are internal or external to the organization. The purpose is to extract knowledge from the history of past events, monitor and react to present events in a timely way or even foresee possible future developments based on the data available.

The main objective of Big Data Analytics is to contribute to better decision making by businesses (ISACA, 2013). By transferring this concept to the context of oversight, one can say that application of the same statistical methods and analytical techniques to auditing activities – which some authors call Audit Analytics – has the purpose of contributing so auditors can make better decision regarding audited entities. To be more specific, it becomes possible to understand and quantify risks, test controls and assess business processes in a quick and efficient manner (PWC, 2013).

When one compares the advances brought about by analytical tools and techniques of the Big Data era with the mechanisms mentioned before to achieve satisfactory cost-benefit in financial audits, important findings arise:

- Using technologies that are appropriate to analyze a large amount of data allows tests to be applied to all financial data of the audited entities, in an efficient way, suppressing the need for previous cuts of **materiality** and **sampling**;
- additionally, such tests may be applied simultaneously in different levels of **accounting entities**, making it possible for auditors to evaluate, in the same audit, both aggregate information and specific accounts of greater relevance;
- results thus obtained can be used, together with inherent risk analysis and internal control evaluations, to improve the targeting of the audit towards the points that have greater probability of showing relevant distortions, thus improving the **risk-based approach**;
- finally, once one has access to the data of systems and transactions that are the basis for financial statements, it becomes possible to repeat the tests with shorter **periodicity**, and this may contribute to a more timely identification of possible distortions.

Therefore, the recent technological advances enable application of analytical procedures and statistical tests on the totality of transactions of one or more entities, in very short intervals, materializing the concept of **continuous auditing** defined originally by Vasarhelyi and Halper (1991) as a type of audit that produces results simultaneously or in a short period of time after a relevant event occurrs. Furthermore, the same tools can be used by the manager himself/herself to implement a **continuous monitoring** process to ensure that the policies, procedures and business processes are operating effectuvely.

It is important to higlight that the applicability of Audit Analytics is not limited to the transactions. It is possible to use analytical methods and techniques to evaluate performance and risk of audited entities according to three dimensions: transactions, results, and controls (KPMG, 2012). Based on this, it can be said that **continuous assurance** occurs when auditors perform continous audit of both the performance and the risks of an entity such as the evaluation of controls and continuous monitoring activities adopted by the manager, as shown in Figure 1.

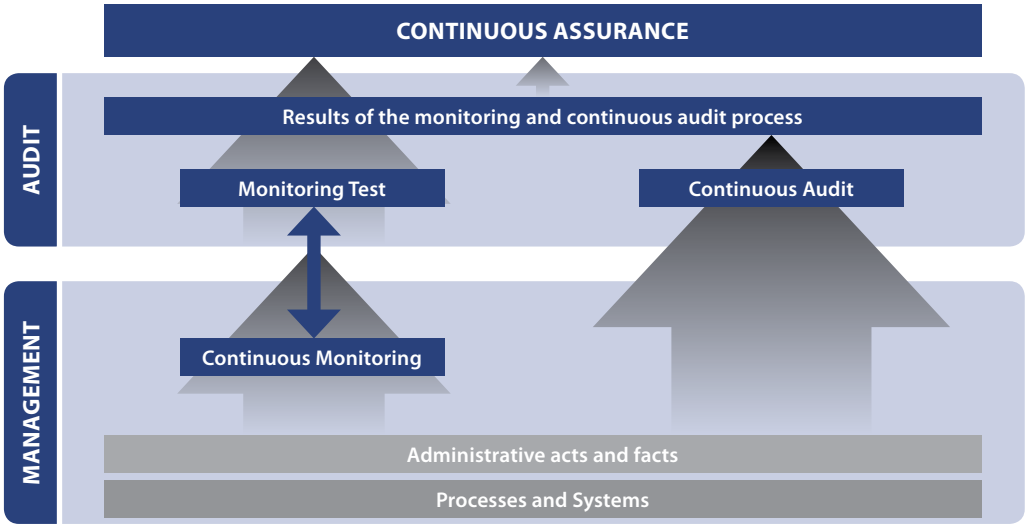
The implementation of this conceptual model, enhanced by the capacity to treat data and by the analytical methods and techniques of the Big Data era, represents a significant advance in relation to the traditional model of financial assurance, based on risk, carried out annually and with limitations created by the use of sampling and materiality cuts.

4. PERSPECTIVES FOR CONTINUOUS FINANCIAL AUDIT IN THE FEDERAL GOVERNMENT

The Federal Government is one of the largest entities in the world from the accounting perspective. On 12/31/2013, the General Federal Balance Sheet showed almost R$ 4.6 trillion in assets and income close to R$2 trillion. In order to manage these assets and resources there is a structure that is larger than that of the majority of government and business entities at the national, multinational and international levels. Currently, there are over 300 federal agencies and entities and more than one million active civil and military servants.

In an entity this size, allocating resources adequately, at the right moment and right place is not an easy task. For this to happen, in 1980 the Integrated Financial Administration System (Siafi) was created. It is the IT system used to register, monitor and control the Federal Government's budget, finance and assets execution. In addition to facilitating the process of consolidation of the federal public accounts, because it is used by all agencies and entities that depend on the Fiscal

Figure 1:
Conceptual model of Continuous Assurance (IIA, 2005)

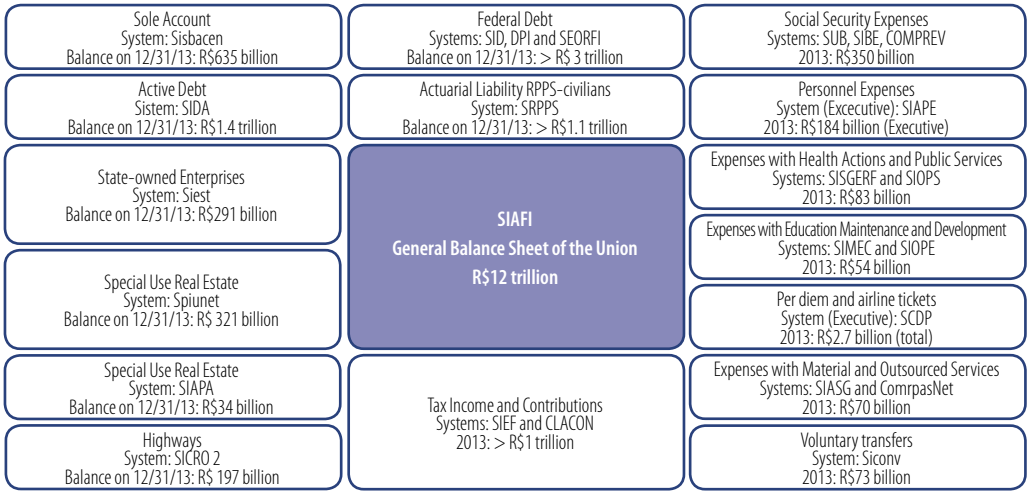


and Social Security Budget, the Siafi is also integrated with other systems that manage federal resources and assets. Among them, the Integrated Human Resources Management System (Siape), the Integrated General Services Management System (Siasg), and the Management System for Special Use Real State of the Federal Government (Spiu). Several other systems produce financial information that is channelled to, recorded and consolidated in Siafi, according to identification and respective balances or amount of transactions represented din Figure 2.

In spite of the level of informatization, the challenge faced by audit work remains big. In 2013 alone 30 million data entry accounting documents were registered in Siafi and approximately 10 percent of this total referred to manual register. The financial information contained in these documents are organized and consolidated in order to enable production of the financial statements of the Federal Government that are consolidated in the General Balance Sheet of the Union (BGU). It also enables production of over three hundred individual financial statements of federal agencies and entities.

From the perspective of internal controls, Siafi has some tests that are similar to the concept of continuous monitoring: automatic and manual analyses of statements, data consistency tests and checks regarding integration with other systems. There are also specific mechanisms to visualize the inconsistencies generated automatically, based on accounting equations, and inconsistencies that are not corrected within the established deadline generate an automatic registry of accounting restriction. The system also offers a module for accounting regularization focused on the correction of errors identified by automatic and manual controls.

Figure 2:
Systems to manage federal resources and assets, with the respective amounts managed



This way, the continuous monitoring does not end after the flaws are detected but after the errors identified are corrected.

Despite the whole chain of internal controls of the Federal Accounting System, it is necessary that an external and independent institution certify the efficacy of these controls and the reliability of the information produced taking into account the concept of financial assurance. This mission is the responsibility of the Federal Court of Accounts due to the constitutional mandate to analyze the accounts rendered by the President of the Republic (article 71, I, of the Federal Constitution/88). The accounts include the General Balance Sheet of the Union (BGU). As for the mandate to audit financial statements of federal agencies and entities, it is provided for in article 71, item IV, of the Federal Constitution/88 and article 16 of the TCU Organic Law.

Even so, we need to acknowledge that financial audit is a fairly recent function if we consider the 120 years of existence of the Court. In view of this, in 2011 TCU signed an agreement with the World Bank with the objective of aligning the audit of the BGU with the international standards and good practices in financial audit. Since then, TCU has improved its approach based on risk, sampling and on the concept of materiality, aiming at giving more effectiveness and efficiency to this activity. The changes implemented favor identification of distortions that are materially relevant in the 2013 BGU. Thus, an alert was issued to the Federal Government advising of the possibility of an adverse opinion being issued on the 2014 Asset Balance Sheet of the Union in case the distortions and deficiencies in internal controls are not corrected in a timely fashion.

In spite of advances, there are still challenges regarding the financial audit function in TCU. Overcoming them can be made easier by using information technology. This is true because in audits of large entities, it is common to adopt approaches that privilege **control tests and analytical procedures** as a response to risks identified in the initial phase of the audit. Thus, the main internal controls are already automated in the Siafi system and can be also checked automatically. In addition, the analytical procedures are evolving by means of equations and indicators that show the behavior of the accounts and make it possible to identify uncommon situations, as parts of continuous audit systems (KOGAN *et al.*, 2010).

Also relevant is the fact that, as of January 2015, the new Accounts Plan Applied to the Public Sector (PCASP) will enter into operation: it is a standardized accounts operation, created with the purpose of enabling consolidation of the National Public Accounts according to the Fiscal Responsibility Law (LRF). Therefore, both the Federal Accounting System and similar ones in the state and municipal spheres will begin dealing with financial information according to the same standard. This will increase the opportunity of elaborating automated analytical procedures that can be applied in large scale. The project for the implementation of the System of Accounting and Fiscal Information of the Brazilian Public Sector (Siconfi), conducted by the National Treasury, intends to make feasible the consolidation of this information in one sole data base that may also be used for audit purposes.

Together with the standardization generated by PCASP, Siafi itself well evolve to become a more modern technological platform that will allow analysis of accounting registries with a one day lag for on online registries, in addition to making it possible to divide information to the level of transactions by means of individual consultations of the input document in Siafi. With the expected increase in analytical capacity offered by the new solution, the potential becomes even greater to apply the Audit Analytics techniques and the paradigm of continuous audit as tools for evaluation and response to risks in Federal Government financial statements.

An example is the bookkeeping account related to expenses with social security, which in 2013 was over R$ 350 billion; undoubtedly, an account that is materially relevant in an audit of the General Balance Sheet of the Union. In order to transform such a large subject matter into an auditable one, it is necessary to understand the underlying public policies and the internal controls of the account. In cases such as this, the analytical procedures are highly recommended in order to evaluate risks by carrying out horizontal analyses (balance evolution), vertical analyses (composition) and analyses of financial and operational indicators. As an illustration, one could carry out analyses of the behavior of concessions, grants, suspensions and cancelations of social security benefits as compared to the evolution of the social security expenses. This in order to obtain evidence of over or under evaluation of the account.

Continuing with the example, in relation to the tests of details in the payment of social security benefits, we know that there is probably more than four hundred Bank Orders, some of them of billionaire amounts and related to payment of thousands, or even millions, of beneficiaries. By using continuous audit and Audit Analytics tools, it would be possible not only to evaluate

risks at the transaction level, but also the application of tests throughout the population – and not only a sample – as a response to the risks evaluated. Such tests could be performed weekly or monthly so that possible inaccuracies could be detected and corrected in a timely way, once the events are identified.

5. FINAL CONSIDERATIONS

As we saw, traditionally financial audit is performed in areas of high risk and by means of statistical sampling, thus making it possible to carry out procedures related to positive cost-benefit and in periodicities that are compatible with the traditional annual financial statements. However, due to technological and social evolution, the financial information flows more quickly and needs to be validated in order to ensure to the users that they are making decisions using the most rational choice, based on reliable and quality information.

Therefore, in the Big Data era, transparency and accountability in real time are already a reality. In the governmental scope, it is the responsibility of the internal and external oversight agencies to monitor this movement by adopting Audit Analytics practices and continuous audit, in order to make it possible to analyze big amounts of information that is varied and in more and more smaller periodicities. In view of this, it is expected that the audit activities will become more efficient, effective and timely.

In face of the magnitude of Accounting and finances of the Federal Government, especially, it will be more and more necessary to innovate in technology. In 2015 the new accounts plan will enter into force, supported by improvements in the Siafi system and by innovations such as the Siconfi project. Finally a new accounting and technology paradigm. This change will also require and enable the advance of financial audit, aiming at ensuring reliability of the data in a more detailed level and in a more timely fashion. The trend is that the annual audit of the General Balance Sheet of the Union be divided into several audits with smaller scopes and periodicities. For this end, continuous audit could be na importante tool in identifying the areas of risk and the relevant accounting distortions, while its logic is exactly to funcion at the transaction level and in real time.

Undoubtedly, with the current paradigm for supply and demand of financial information, continuous audit is a trend in Brazil for the public and private sectors. |Nevertheless, this trend depends significantly on the very development of auditing in the country. According to Alles *et al*. (2006a), in Brazil there is one independent auditor for every 25 thousand people, while in the USA there is one for every 2.300, in the United Kingdom, one for every 1.300, and in Holland, one for every nine hundred. Thus, technological resources can favor the growth of audit in Brazil, but we must build the capacity of human resources. Evolution towards automation of financial audit should be accompanied by the development of competencies of the auditors to deal with this new reality. It is worth mentioning that technology does not replace human knowledge; it increases the potential for its use.

Meanwhile, continuous audit is a vision for the future. Despite this fact, awareness regarding the evolution of technological solutions is the starting point for this future to be nearer and nearer. To take advantage of this innovation means to improve management of financial resources, by detecting and correcting in a timely way the deficiencies of internal controls, errors and frauds, as well as to improve risk management and governance. As a result, it is expected that the oversight agencies begin counting with tools that are more and more efficient and effective, in order to ensure good management of public resources, reliability of accounting information and financial sustainability of government institutions.