Innovation and Practice of Continuous Auditing (Draft v.8)

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I. Abstract

The business and economic environment is changing on a daily or even on an intraday basis in the real time economy. For a business to maintain its competitive edge, management must make decisions based on timely and accurate financial information. However, the traditional audit paradigm is outdated in the real time economy and is not suitable to provide real time assurance. Management and their auditors recognize that innovation in the practice of traditional auditing is necessary to satisfy the demand for real time assurance. As a potential solution, management and their auditor have considered the adoption and implementation of the continuous audit. For auditors and the audit profession, continuous auditing will transform the traditional auditing paradigm by providing innovative approaches to audit methodology. This paper discusses some of these major innovations and provides a framework which outlines the stages and processes of a continuous audit.

Keywords: Continuous Auditing, Traditional Auditing, Innovation, Audit Methodology, Audit Stages, Data Analytics

II. Introduction

The objective of financial reporting is to provide information that is useful to management and stakeholders for making resource allocation decisions (FASB 2006). For information to be useful in the real time economy, it should be timely and free from material misstatements, omissions, and fraud. (Hunton, Wright et al. 2007) finds that timely reporting with assurance can enhance the usefulness of financial reporting for decision making. Advancements in accounting information systems such as enterprise resource planning (ERP) systems have enabled the timely generation of financial information. However, the ability to provide real time assurance has lagged in the traditional paradigm. Under the traditional reporting paradigm, the level of assurance degrades as the reporting timeframe is reduced. For example, annual reports are audited, quarterly reports are reviewed, and monthly and daily reports are not audited or reviewed. The lack of assurance can lead management or stakeholders to make inappropriate resource allocation decision as the use and reliance on real time financial information increases.

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The lag in providing real time assurance is due to the nature of manual audit procedures. A traditional audit is labor and time intensive. These constraints limit the frequency of performing an audit and thus inhibit the suitability of a traditional audit for providing real time assurance. Innovation of the audit using technology such as continuous auditing (CA) is necessary to support real time assurance. (OECD 1997) defines a technological process innovation as the implementation of new or significantly improved production or delivery methods of goods or services. Continuous auditing improves the delivery of auditing services by making an audit more effective and efficient. A continuous audit can alleviate the cost and labor intensiveness of an audit (Alles, Brennan et al. 2006). For auditors and the auditing profession, continuous auditing will innovate the approach to performing an audit in the real time economy.

In this paper, we discuss how continuous auditing has innovated audit methodology in six major dimensions (Table 1).

- First, audits occur on a continuous or frequent basis.
- Second, manual audit procedures are automated.
- Third, the role and the work performed by internal and external auditors will change.
- Fourth, continuous auditing changes the nature, timing, and extent of audit testing.
- Fifth, data analytics are used as the primary testing tool and as evidence to support a continuous audit opinion.
- And sixth, the continuous audit consists of four audit stages; automation of audit procedures, data modeling and benchmark development, data analytics, and reporting.

Collectively, these six innovations to traditional audit methodology will help alleviate the constraints of providing real time assurance.

The remainder of the paper is organized as follows: Section III discusses the continuous auditing innovations in audit methodology. Section IV, the continuous audit stages and audit processes are examined. And Section V concludes about the contributions that CA brings to the methodological practice of audit and the contributions of this paper.
The concept of continuous auditing was first introduced by (Vasarhelyi and Halper 1991) and (Groomer and Murthy 1989). The acceptance of continuous auditing methodology has been demonstrated by implementation or prototyping of continuous auditing at large institutions such as AT&T Corp., Siemens, HCA Inc, Itau Unibanco, IBM, HP, MetLife, and Proctor & Gamble among many large corporations. Furthermore, the interest in exploiting CA technology has advanced to the point where practitioners are reaching out and collaborating with the academic research community for...
innovation\(^2\). Management and their auditors recognize that the traditional approach to auditing is outdated in the real time economy\(^3\) and that innovative approaches to the methodology practice of auditing is needed to support real time assurance.

*Continuous or Frequent Audit*

The continuous auditing of transactions and monitoring of controls in real time may be ideal. However, real time auditing and monitoring can impact the operation of the accounting information system. Du and Roohani (2007) propose a continuous auditing cycle model that mirrors the traditional audit engagement period. A cycle starts when the auditor connects into the accounting information system and ends when the auditor disconnects. The auditor can connect into the system after a period of time or a number of transactions (Du and Roohani 2007). However, a continuous audit cycle dependent on transactions may be more cost-effective (Pathak, Chaouch et al. 2004). Real time continuous auditing and monitoring will tend to occur in areas of high risk. For example, transactions involving treasury disbursements have higher risk and can be continuous audited and monitored in real time. On the other hand, prepayment expenses are considered a low risk area and can be audited in frequent cycles. Nevertheless, the more frequent the continuous auditing cycle the more reliable the accounting data will be.

*Automated Audit Procedures*

A traditional audit is labor and time intensive due to the preponderance of manual audit procedures. In a continuous audit, most of the manual audit procedures are automated and performed by the computer. (Vasarhelyi, Alles et al. 2004; Alles, Brennan et al. 2006) suggest the use of pre-existing manual audit procedures as a starting point to determine which audit procedures can be formalized for automation. The automation of all manual audit procedures may not be feasible due to some requiring the judgment and subjectivity of auditors\(^4\). However, the ability to automate some audit procedures can still potentially lead to large cost savings (Alles et al., 2006) and can significantly contribute to the effectiveness of an audit (Du and Roohani, 2007).

The standardization of data collection and well defined internal control policies are fundamental requirements of automating audit procedures. For example, free form input text-fields should be avoided as much as possible. If the data inputted into the system is not standardized, the auditor would potentially have to manually clean the data before testing can be performed. The tedious process of data cleaning will partially eliminate the benefit and efficiency of automated testing. Furthermore, the internal control policies within a company should be well defined in order to support automated testing.

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\(^2\) 19\(^{th}\) World Continuous Auditing and Reporting Symposium (2009) and Continuous Auditing Research Projects at Rutgers Continuous Auditing Lab

\(^3\) http://raw.rutgers.edu/Galileo

\(^4\) Although audit judgment can also be substantially formalized/automated this is a higher level process which typically takes substantive time to develop (Vasarhelyi & Halper, 1991)
of internal control violations. The standardization of data and formalization of internal control policies will allow automated testing procedures to run with little or no human intervention.

Role of Internal and External Auditor

(Vasarhelyi, Alles et al. 2004) proposed four levels of audit objectives for continuous assurance and analytical monitoring;

- Level 1: transactional verification,
- Level 2: compliance verification,
- Level 3: estimate verification, and
- Level 4: judgment verification.

As the audit objective level becomes more complex, verification requires increased human judgment and hence limiting immediate automation. The role of the auditor will change or evolve from performing tedious manual audit procedures such as detailed transaction and controls testing to focusing on evaluating/supporting estimates, judgments, and the exceptions generated by CA testing.

The implementation of continuous auditing is usually an internal audit function (Vasarhelyi, Alles et al. 2010; Vasarhelyi, and Kuenkaikaew. 2010.), but continuous auditing can also be used/implemented by external auditors. The nature, timing, and extent of CA testing will make the work of internal and external auditors overlap. Hence, we hypothesize that the external auditor role may eventually evolve to become both an independent certification provider of the internal audit CA system, and also provide complementary analytics and judgment on top of the IA system. The external auditors will evaluate and attest to the operation of the CA system.

(Alles, Kogan et al. 2004) suggest the use of a third party black box log file to serve as an audit trail of a continuous audit. The log file will serve as documentation to provide evidence that there were no intervention in the CA system and that all audit procedures and testing were consistent with audit standards. The independent external auditors can objectively use the log file to verify whether abnormalities exist or interventions were made by management during the operation of the CA system. The external auditor can also serve as an advisor to recommend improvement to audit procedures and testing performed by the continuous auditing system.

A more drastic role for the external auditor would be of monitoring attestation where a “evergreen seal/ opinion” (CICA/AICPA, 1999) would be issued at the regular audit time and maintained as far as no impairing conditions arose during continuous monitoring and audit. This form of assurance both of financial reporting as well as ongoing control and data integrity would require substantially departure from today’s regulations.
Nature, Timing, and Extent of Testing

The continuous auditing methodology changes the nature, timing, and extent of traditional audit testing.

- In a traditional audit, manual internal control and substantive testing are primarily used to evaluate management’s assertions. On the other hand, automated continuous controls monitoring and continuous data assurance are used in a continuous audit (Alles, Brennan et al. 2006; Alles, Kogan et al. 2008; Alles, Kogan et al. 2008) (Nature). In continuous controls monitoring, the CA system will continuously monitor internal controls for violations. In continuous data assurance, transactional data is monitored continuously for anomalies or outliers.

- In the traditional audit, internal controls testing occur in the planning stage and substantive testing occurs in the fieldwork stage of the audit. On the other hand, internal controls and transaction details testing occur simultaneously in a continuous audit (Timing). The simultaneous testing of internal controls and transaction details is necessary to provide real time assurance (Rezaee, Elam et al. 2001).

- A traditional audit relies on the use of sampling due to the labor and time intensiveness of testing. The use of sampling increases the probability that misstatements, omissions, and fraud may go undetected. A continuous audit considers the full population when testing (Extent) (. The extent of testing in continuous auditing provides better support for the audit opinion. However, this does not preclude that all material misstatements, omissions, fraud, and internal control violations can be detected by the CA system. Management can collude and override the continuous auditing system.

Data Analytics

Traditional audit analytics mainly consist of basic statistical techniques such as ratio, trend, and regression analysis (Stringer, Stewart et al. 1986). These analytics are applied at the account balance level and are performed manually by the auditor. In a continuous audit, the analytics are automated and applied at the account balance level and transaction details level (Kogan et al, 2010). The data analytical techniques used in a continuous audit come from the area of statistics, machine learning, and data mining. The main types of data analytics are regression, classification, association, and clustering. The main assumption behind data analytics is future unaudited data should be similar to historical audited data. Data mining and machine learning techniques have been used extensively in the accounting and auditing literature for bankruptcy prediction (Tam 1991; Sung, Chang et al. 1999; Min and Lee 2005; Wu, Tzeng et al. 2007), going concern prediction (Martens, Bruynseels et al. 2008), fraudulent financial statements (Kirkos, Spathis et al. 2007; Kotsiantis, Koumanakos et al. 2007), auditor selection (Efstathios, Charalambos et al. 2008), and audit qualification prediction (Dopuch, Holthausen et al. 1987; Doumpos, Gaganis et al. 2005).
Data analytics are generally applied to transaction data and not to internal controls monitoring. In controls monitoring it is usually a simple binary function of compliance or non-compliance. However, analytics can be used to detect abnormal behavior associated with potential internal control violations. When data analytics are applied to transactional data, the attributes of a transaction are considered. For example, the bill date, vendor, items order, item cost, order pattern, and the total amount are considered in testing. The consideration of these attributes makes the testing of management’s assertions more comprehensive. Using these attributes, data analytics evaluates the normality and behavior of the transaction. The process of monitoring in the continuous auditing environment consist of continuously comparing unaudited observations with benchmarks (Vasarhelyi, Alles et al. 2004). Observations that are outliers or anomalies when compared with benchmarks are flagged as exceptions by the system for investigation by the auditor. The transactions flagged as exceptions can be aborted or suspended until investigated by the auditors. Hence, a continuous audit can be considered a proactive versus a reactive audit.

IV. Continuous Audit Stages and Audit Processes

The continuous audit consists of four major stages; Stage 1: Automation of audit procedures, Stage 2: Data modeling and benchmark development, Stage 3: Data analytics, and Stage 4: Reporting (Figure 1).

- Stage 1, the auditor identifies business process areas where to apply continuous auditing technology. Anecdotal evidence suggests data access should be a prime consideration in deciding on the initial area to apply continuous auditing. Once the business process is identified, the auditor can use preexisting audit procedures to identify types of tests that can be formalized and automated (Vasarhelyi, Alles et al. 2004; Alles, Brennan et al. 2006).

- Stage 2, the data modeling process consists of dividing the audited historical data into two datasets; training and validation. The training set is used to train an analytical model or algorithm to discriminate what transaction attributes or behavior characteristics are considered normal (benchmark). Supervised and unsupervised learning are two methods used to train the analytical models. In supervised learning, the positive and negative instances are known for the dependent variable. For example, we have cases of known fraudulent transactions (positive instances) and we have cases of known non-fraudulent transactions (negative instances). In this case, the model can learn the discriminating characteristics between fraudulent and non-fraudulent transactions. In unsupervised learning, both positive and negative instances are unknown. The objective of unsupervised learning is to identify regularities or patterns in transactions. Instances that are group based on similar characteristics are considered normal or the benchmark of what future instances should look like. The validation set is used to measure the trained model’s accuracy and performance in discriminating unseen positive and negative instances. The modeling of data and development of benchmarks is an iterative process. The benchmarks are continuously recalibrated as new audited data exist.
Stage 3, data analytics consist of transaction analytics and account balance level analytics (Dual level). Transaction analytics compares unaudited transaction data with the benchmarks developed from data modeling. For account balance level analytics, the correlation of each account balance is considered in relations to other account balances. The correlated relationship between accounts can be used to monitor and assess areas of potential risk. (Vandervelde 2006) suggest the consideration of the overall financial statements and the relationship between accounts when determining risk. A dual level of analytics is necessary because management establishes and maintains internal control and thus may circumvent them through collusion and evade detection by the continuous auditing system. This is not a specific CA deficiency but rather this can occur in a traditional audit as well.

Stage 4, a continuous audit is an audit by exception (CICA/AICPA 1999). A clean audit report can be issued by the system if there are no exceptions or alarms generated by the system. However, a clean opinion cannot be issued if the system has material exceptions that have not been resolved by the auditor. The exceptions come in the form of a report indicating the details of the problem. The auditor will evaluate the exception details and decide whether to investigate further. Similar to the analytical review procedures describe in (Hirst and Koonce 1996), if further investigation is warranted, the auditor develops possible explanations for the anomaly and seeks out collaborating information to support their self generated explanations. Based on the collaborating information, the auditor decides whether to pursue further evidence. If the auditor is satisfied with the collaborating evidence then the auditor can document their finding and resolution.

Figure 1 – Continuous Audit Stages and Processes
V. Conclusion

Advancement in technology and communications has enabled the generation and use of real time financial reports by management and stakeholders. However, these real-time or close to real time financial reports do not carry a level of assurance similar to annual or quarterly reports. As management and other stakeholders rely more and more on these real time financial reports to make material business decisions, there will follow a demand or requirement for a level of assurance on those financial reports. However, the cost of implementing a more frequent audit under the current auditing paradigm can be prohibitively expensive due to the labor and time constraints. Hence, the traditional auditing methodology is not suitable to support real time assurance. Management and their auditors recognize that innovation of traditional auditing methodology is necessary to alleviate the constraints of providing real time assurance. Practitioners and academics are opening up to continuous auditing as a viable solution for real time assurance. CA transforms the traditional audit paradigm by providing innovative approaches to audit methodology. These innovative approaches make the practice of audit
more effective and efficient through the use of technology and automation. Under the continuous auditing environment, auditors can devote their time and efforts to tasks requiring judgment or subjectivity and analyzing exceptions from the CA system. Ultimately, the application of CA by companies will enable real time assurance.

The contribution of this paper to the CA literature is twofold: 1) this paper defines how CA has innovated audit methodology and 2) provides a framework describing the audit stages and processes of a continuous audit for future researcher to advance the development of CA. Concluding it is essential that continuing collaboration between practitioners and academic researchers develops to truly advance the innovation and practice of continuous auditing technology and methodology.
References


