
Continuous auditing: the audit of the future

Zabihollah Rezaee

Professor of Accounting, Middle Tennessee State University, Murfreesboro, Tennessee, USA

Rick Elam

Reynolds Professor of Accountancy, University of Mississippi, Oxford, Mississippi, USA

Ahmad Sharbatoghlie

Senior Systems Consultant, Boston, Massachusetts, USA

Keywords

Real time, Accounting system, Information technology, Information systems, Internet

Abstract

Technological advances (e.g. e-commerce and the Internet) have changed business practices and the process of recording and storing business transactions. Extensible Business Reporting Language (XBRL) will soon be built into accounting and reporting software which would allow on-line real-time preparation, publication, examination, and extraction of financial information. Thus, outside, independent auditors should use continuous, electronic auditing when most financial information exists only in electronic form under real-time accounting systems. Continuous auditing and its implications for independent auditors, including internal control considerations and audit procedures, are described and analyzed.

Introduction

The emerging information technology (IT) has spawned new business approaches such as electronic commerce, electronic data interchange (EDI), and the Internet. These approaches have changed business practices and the process of recording and storing business transactions. Doing business on the Web through the use of Internet technology enables organizations to connect into the on-line world and improve all aspects of their business. The Web site can improve selling products or services by giving options to existing or potential buyers to purchase products or services directly on-line. Business transactions can now be in electronic form without any paper documentation, enabling organizations to produce financial information on a real-time, on-line basis. Most recently, businesses are shifting from relatively costly EDI to less costly and more flexible Extensible Markup Language (XML). Furthermore, Extensible Financial Reporting Markup Language (XFRML) is also being developed to facilitate companies in sharing financial information.

The new information technologies (e.g. the Internet, EDI, XML, XFRML) have crossed national boundaries to change the way organizations operate. Many entities now disclose their quarterly and annual reports on the Internet. Extensible Business Reporting Language (XBRL) is now receiving support and popularity from the financial community and the accounting profession. XBRL is a standardized electronic language for business reporting which facilitates the preparation, publication, examination, and extraction of financial information. Under XBRL, the information is entered only once and it can then be rendered in any form, such as a printed financial statement, an HTML

document for the company's Web site, and EDGAR filing document for the SEC, or any other specialized reporting format (Zarowin and Harding, 2000). SBRL fosters effective and efficient preparation, automatic exchange, and reliable extraction of financial information across all technology formats including the Internet. XBRL will reduce repeatable financial reporting processes and will provide a platform for on-line real time accounting systems. Independent auditors should use continuous, electronic auditing when most financial information exists only in electronic form. The primary purposes of this paper are to:

- 1 discuss continuous auditing (CA) and its implications for independent auditors;
- 2 examine internal control of the ever-changing IT; and
- 3 examine key auditing aspects of new IT.

Continuous auditing

Making high-quality and timely decisions depends in part on the quality of the data and the existence of on-line and real-time information. Electronic and digital information is more flexible, accessible, transferable, and can be more easily stored, summarized, and organized than paper information. Information technologies have enabled organizations to conduct their business transactions electronically and prepare their financial statements on an on-line and real-time system. Under real-time accounting (RTA) systems, much of the financial information and audit evidence are available only in electronic form. Traditional source documents such as purchase orders, invoices, and checks are replaced with electronic messages, and underlying accounting data (e.g. journals, ledgers, and schedules) are in electronic forms or files (Rezaee *et al.*, 2000).

The change in business process that removes a traditional source of information requires the creation of new audit



procedures to conduct financial audit. The primary objective of financial audit and generally accepted auditing standards (GAAS) does not change because all or a part of the client's records are in electronic form. However, audit procedures may change when most information exists only in electronic form under the RTA system that requires the independent auditor to employ CA. CA is defined "as a systematic process of gathering electronic audit evidence as a reasonable basis to render an opinion on fair presentation of financial statements prepared under the paperless, real-time accounting system". CA, in other words, is a process of gathering and evaluating evidence to determine the efficiency and effectiveness of RTA in safeguarding assets, maintaining data integrity, and producing reliable financial information.

A number of emerging audit technologies, including the utilization of automated software, CA techniques, embedded audit modules, integrated test facilities, and concurrent audit tools can be employed in performing electronic on-line auditing. Concurrent audit techniques allow auditors to design programming codes and implement them directly into a variety of computer applications to continuously select and monitor the processing of data. These techniques (e.g. the snapshot approach and systems control and audit review facility) are likely to become more relevant and receive increased use under CA. The Canadian Institute of Chartered Accountants (CICA) and the American Institute of Certified Public Accountants (AICPA) issued a research report on CA in 1998 (CICA, 1999). The research report provides a definition for CA, reemphasizes the importance of continuous audits, discusses a conceptual framework for conducting CA, and examines significant audit issues of performing CA. The research report reached the following three main conclusions:

- 1 continuous audits are viable, provided certain, interrelated conditions are met;
- 2 research by academics, experimentation by practitioners and guidance from standard setters are all necessary to help continuous audit services evolve; and
- 3 demand for more reliable, relevant, and timely decision-making information is likely to create a need for continuous audits, but the auditing profession needs to position itself to respond appropriately to the marketplace (CICA, 1999, p. XIII).

The audit process is evolving from the manual audit of accounting systems with paper documentation to on-line, continuous electronic audit of EDI, paperless systems.

Auditors are realizing that manual audits (auditing around computer) are not efficient under RTA systems. A financial statements audit may have to be performed on a client's RTA system that lacks access to the traditional paper trail audits because they have been eliminated or electronically stored under a RTA. CA affects the auditing process in several ways. First, the auditor's knowledge of the client's business and industry has to increase to ensure reliability and relevance of electronic documents, records, and data. Second, the auditor has to better understand the flow of transactions and related control activities to ensure validity and reliability of information in a paperless, RTA system. Third, the auditor has to use a control risk-oriented audit plan that primarily focuses on adequacy and effectiveness of internal control activities of the RTA system and place less prominence on substantive tests of electronic documents and transactions. There are many different ways of approaching and planning the audit of RTA with the use of software application programs (e.g. Interactive Data Extraction and Analysis (IDEA) and XBRL).

The major benefit of utilizing CA is the reduction of the cost of performing an audit engagement. CA enables auditors to test a larger sample (up to 100 percent) of clients' transactions and data faster and more efficiently than the manual testing of auditing around the computer. CA can reduce the amount of time and costs auditors traditionally spent on manual examination of transactions and account balances. CA may also increase the quality of financial audits by allowing auditors to focus more on understanding a client's business and industry and its internal control structure. Accounting firms are moving away from traditional paperwork audits by using Web-based auditing program and CA. For example, Deloitte & Touche, in cooperation with Intacct Corp., are in the process of developing the first Web-based auditing program for medium-sized companies (Intacct Corp., 2000). Clients would provide financial information continuously throughout the year, which would allow CA, rather than audit a company's books on-site at the end of the year.

Table I presents an overview of the accounting cycle under RTA systems and the related audit process under CA. Table I shows that RTA system consists of the following processes:

- 1 identification of transactions and other economic events;

Table I

Overview of the accounting cycle and the related audit process

Time period	Client: real-time accounting system (RTA)	Auditor: continuous auditing (CA) method	Audit activities
	Transactions and other economic events	Audit planning	Continuously obtaining information about the client's business and industry Continuous update of knowledge and understanding of client's internal control structure including control environment and activities Designing of audit strategy including applying audit risk model and preliminary audit programs
Interim financial statements 1/1/X1-12/31/X1	On-line, real-time accounting information system		
	Internal control structure	Consideration of internal control structure	Continuous understanding and evaluation of internal control structure Performing electronic tests of controls Modifying audit programs
Interim financial statements 1/1/X1- 12/31/X1	Processed transactions electronically	Substantive tests of details of transactions	Selecting appropriate electronic audit tools and techniques Performing audit procedures Ensuring reliable means of obtaining competent and sufficient audit evidence
Year end 12/31/X1-3/25/X2	On-line general and subsidiary account balances ledger	Substantive tests of account balances and analytical procedures	Gathering sufficient and competent audit evidence Evaluating the timeliness and reliability of audit evidence Monitoring continuous audit approach
	On-line, real-time financial statements	Complete the audit and issue an audit report	Issuing audit report Improving continuous audit approach Deciding whether to accept or continue a continuous audit engagement

- 2 measurement, recognition, and reporting of transactions under the on-line, real-time accounting information system;
- 3 existence of an adequate and effective internal control structure;
- 4 processing of transactions electronically;
- 5 on-line general and subsidiary account balances ledger; and
- 6 preparation of on-line, real-time financial statements.

CA consists of five phases:

- 1 planning an audit engagement including analytical procedures;
- 2 consideration of the internal control structure of RTA including performance of tests of controls and assessment of control risk;
- 3 execution of the interim and continuous substantive tests of detail of transactions;
- 4 performing the end of the year substantive tests of account balances and overall results including analytical procedures; and

- 5 completing the audit and issuing an audit report.

During the planning stage of the RTA system, auditors should pay attention to availability and auditability of electronic forms, records, and documents. Consideration of the internal control structure of the RTA system is similar to that of a manual system, which requires the auditor to understand all the five components of the internal control structure as stated in the Statement on Auditing Standards No. 78 (SAS 78) (AICPA, 1995). Auditors gather sufficient competent evidential matter electronically as a reasonable basis to render an opinion on the financial statements.

Internal controls

Technological advancements have increased the importance placed on internal controls. Consistent with the Committee of Sponsoring Organizations (COSO) report and SAS 78 (AICPA, 1995), Table II presents control components, description, attributes, and techniques of a real-time accounting system and the related internal control structure. The five components of the internal control structure as stated in the COSO report and SAS 78 (AICPA, 1995) are control environment, risk assessment, information and communication, control activities, and monitoring. Sufficient understanding of these five control components assist auditors in deciding whether or not adequate control activities are built into an RTA system. If adequate control procedures exist, then the auditor should perform tests of controls to determine the effectiveness of internal control structure policies and procedures in preventing, detecting, and correcting material misstatements in the financial statements. Assessment of control risk determines the degree of reliability of the internal control structure. Consideration and review of the internal control system is important under an RTA system. This review of internal controls helps the independent auditor assess the internal control risk and formulate an opinion on the level of reliability that can be placed on the internal control structure of an RTA system. Reliability of the internal controls is the foundation for determining the nature, timing, and extent of substantive audit procedures performed in gathering sufficient and competent evidence.

Traditionally, independent auditors perform tests of controls to assess the adequacy and effectiveness of the internal control structure to determine the aspects

(nature, timing, and extent) of substantive tests. Independent auditors perform tests of controls to gather evidence as a basis for reducing more costly substantive tests. However, under the RTA system, auditors perform tests of controls simultaneously with substantive tests of details of transactions to gather evidence on reliability of the RTA system in producing reliable and credible financial information. Tests of controls begin with auditor's review and understanding of management controls. If these controls are not operating effectively as intended, then there might be no need to test application controls. If auditors decide that management controls are adequate and effective, they then assess the sufficiency and effectiveness of application controls related to material classes of transactions in the various application subsystems.

Consideration of RTA internal control structure involves examination and assessment of both management controls and application system controls. Auditors study and evaluate the control environment and risk assessment components of the internal control structure by examining management controls (e.g. audit committee, management philosophy and operating style, managing risk). Auditors study and evaluate specific control activities by examining both management and application system controls (e.g. input, processing, output, and managerial controls). AU 319.49 states that "evidential matter about the effectiveness of design or operation (of internal control structure) may be obtained through ... the use of computer assisted audit techniques" (SAS 80) (AICPA, 1996)

The most commonly used computer-assisted audit techniques in testing the effectiveness of the internal control structure among others (Koch, 1981; Clark *et al.*, 1989), are:

- 1 test data or integrated test facilities in determining whether the RTA system is correctly processing valid and invalid transactions and in verifying correctness and completeness of processing;
- 2 parallel simulation in developing a computer program that replicates some part of a client's application system in assessing the effectiveness of control activities;
- 3 concurrent processing in designing audit modules and other programming codes and implementing them directly into important computer applications to continuously select and monitor the processing of data; and
- 4 continuous and intermittent simulation (CIS) which is used to select transactions

Table II
Control matrix for RTA and CA

Control components	Description	Control attributes	Control techniques
Control environment	Management should assess the effect of RTA on the organization's existing control structure and set the tone to ensure that potential new risks are properly managed. Management should ensure that RTA is well managed	New way of doing business electronically Intercompany dependencies Changes in business cycles Level of computer sophistication, integration, and automation	Sound business strategy and management commitment Managing third party network providers Trading partner agreements Security controls for Internet business Controlling software development
Risk assessment	Risk assessment is a process of identifying, analyzing, assessing, and managing risks of doing business electronically, and risks relevant to processing transaction electronically and producing on-line, real-time financial statements and the ways these risks can be managed	Relationship of risks to specific financial statement assertions and the related activities of electronically recording, processing, and preparing financial reports Internal and external risks and the related events, circumstances Assessment of the impact of on-line, real-time accounting system on internal control structure to ensure that potential new risks are properly managed	Automated controls Line conditioning to reduce noise level Digital signatures and non-repudiation assurances Compliance program Control self-assessment program
Information and communication	The information system includes the electronic accounting system and real-time accounting system designed to produce electronic financial records, documents, and reports. Communication involves preparing and disseminating financial information in on-line, real-time fashion. This element of the control structure ensures that information is identified, captured, and exchanged in a timely and appropriate form to allow personnel to discharge their responsibility properly	Integrity controls should be designed to ensure that transactions are accurate, complete, and valid Sound real-time accounting system should produce reliable financial information and prevent misstatements in financial statements Effective real-time accounting system should provide adequate and auditable transaction trail	Protection controls against the disclosure of information to unauthorized parties (Encryption) Access controls to limit access to authorized individuals and to protect against unauthorized access to the accounting information system (firewalls) Audit transaction set or audit database Backup and retention policy Continuous and compliance auditing

(continued)

Table II

Control components	Description	Control attributes	Control techniques
Control activities	Policies and procedures designed to ensure: (1) achievement of entity objectives; (2) reliability of financial statements; (3) safeguarding of assets; and (4) compliance with applicable laws and regulations. Control activities ensure transactions are authorized, duties are segregated, adequate documents and records are maintained, and assets and records are safeguarded	Control activities to ensure that all software, hardware, electronic data, and records are adequately protected against unauthorized disclosure or change during storage or transition Physical access is restricted Effective and efficient real-time accounting system is used Appropriate backup, retention, and contingency plans are in place	Authorization procedures Transaction identification and authentication Encryption Hardware controls Organization controls Documentation and records Information processing controls Segregation of duties Back-up and retention policies
Monitoring	Periodic or ongoing process of assessing the quality, integrity, and reliability of the real-time accounting system and the related internal control structure. This element ensures internal control activities are adequate and operating effectively and reliably over time	Ongoing monitoring activities Separate periodic assessments Compliance and system audits by internal auditors Continuous audits by external auditors	Through the system audits Embedded audit modules Computer-assisted audit techniques Automated auditing systems Systems control and audit review facility Snapshot approach

during processing for audit review and provide an on-line auditing capability.

Concurrent audit techniques such as the snapshot approach and the systems control and audit review facility (SCARF) are expected to receive increased attention and use under CA in testing the effectiveness of the client's internal control structure. Evidence gathered by performing tests of controls provides a basis for auditors to assess control risk and to finalize the audit plan by determining the nature, timing, and the extent of substantive tests.

Auditing aspects of IT

Independent auditors should consider the availability of evidence in electronic forms and its implication to determine the extent of tests of controls and the nature, timing, and extent of substantive tests. Ever-increasing IT and the use of electronic commerce require auditors to obtain evidence electronically and, accordingly, encourage the accounting profession to incorporate the concept of electronic evidence into its professional standards. Thus, in December 1996, the Auditing Standards Board (ASB) of the AICPA issued the Statement on Auditing Standards No. 80 (SAS 80) (AICPA, 1996). The AICPA also published an Auditing Procedures Study (APS) entitled *The Information Technology Age: Evidential Matter* in January 1997 (AICPA, 1997) to provide auditors with additional guidance to apply the provisions of SAS 80.

SAS 80 states that auditors of entities that transmit, process, maintain or access significant amounts of electronic information may be unable to reduce detection risk to an acceptable level by performing only substantive procedures, requiring them to normally perform tests of controls to obtain evidence to help achieve an assessed level of control risk sufficiently below the maximum. Certain electronic evidence may exist at a particular point in time but may not be available after a specified period, if files are changed and backup files do not exist. Thus, SAS 80 states that the auditor should consider the time during which information exists or is available in determining the nature, timing, and extent of substantive tests.

Every audit engagement involves testing management's assertions (e.g. existence of assets, liabilities and owner's equity, quality of earnings, reliability of internal control, compliance with applicable laws and regulations) by gathering sufficient and competent evidence. For large and highly

computerized entities, the evidence may be in an electronic form, while for small and traditional organizations the evidence may be still in a paper-document format. Thus, different audit procedures and different evidence is appropriate to each of these audit engagements. To issue an audit report, the auditor should determine:

- 1 what evidence is required to address each assertion;
- 2 what audit procedures gather competent and persuasive evidence for each of the assertions;
- 3 how much evidence is sufficient; and
- 4 the most reliable and efficient means of gathering sufficient and competent evidence.

Audit of an RTA system requires auditors to obtain sufficient competent audit evidence to satisfy themselves with convincing answers to the following questions:

- 1 Are the electronic records available?
- 2 What is the client's record retention policy?
- 3 What control activities are in place to safeguard records?
- 4 Are detail and summary records available for the audit period?
- 5 Are the electronic records reliable?
- 6 Are encryption and authentication controls in place to ensure integrity of electronic documents?
- 7 Is the internal control structure adequate and effective to ensure the reliability of electronic evidence?
- 8 Where do the numbers (financial items, e.g. inventory) on the financial statements come from?
- 9 What are the origins of the client's electronic records?
- 10 Is there an audit trail and to what extent?
- 11 When, where, and how will the electronic records and documents be audited?
- 12 Can the audit evidence be audited using the client's computer facilities?
- 13 Does the auditor have adequate hardware and software resources available to conduct an audit of electronic evidence?
- 14 What audit software packages are available?
- 15 What computerized simplifying techniques are available to audit electronic evidence?

Auditors perform audit procedures to gather sufficient competent evidence in satisfying the third standard of fieldwork and use it as a reasonable basis for expressing an opinion on fair presentation of financial statements. Substantive tests are audit procedures designed to test for dollar misstatements materially affecting fair presentation of

financial statements in conformity with generally accepted accounting principles. There are three types of substantive tests: analytical procedures, tests of details of transactions, and tests of details of balances.

Analytical procedures

Analytical procedures are studies of comparisons and relationships among financial data. Analytical procedures typically involve calculation of ratios and their comparison with those of previous years. Thus, the use of IT and CA makes it more feasible to perform analytical procedures. SAS 56 (AICPA, 1988) requires auditors to use analytical procedures during planning and final reporting phases of audit engagements. Analytical procedures must be performed during the planning phase of the audit to better understand the client's business and industry. They can also be used during the evidence-gathering phase of the audit to provide indication of the presence of possible misstatements in the financial statements and possible reduction of the extent of tests of details of transactions and account balances. Analytical procedures are also performed during the final reporting phase of the audit to assess:

- 1 the overall audit results;
- 2 reasonableness of transactions and balances; and
- 3 the entity's ability to continue as a going concern. With the use of concurrent audit techniques and computer technology, analytical procedures can be the least costly audit tests to perform.

Tests of transactions

Auditors conduct tests of transactions to assess whether erroneous or irregular processing of transactions has caused material misstatements in financial statements. These tests include tracing journal entries to their source documents or vouching source documents to their related journal entries. The computer audit aid techniques are quite useful in performing these interim tests and gathering evidence for the final tests of balances. Under CA, auditors conduct tests of transactions continuously throughout the year at interim dates in order to reduce the extent of substantive tests of balances to be done after the balance sheet date. If the evidence gathered by performing tests of transactions indicates that material errors and irregularities have occurred or might occur or that financial information is or might be materially misstated, then substantive tests of balances will be expanded. Under CA, tests of transactions should be performed

concurrent with tests of controls as dual-purpose tests.

Tests of balances

Substantive tests of balances, under CA, are performed after the balance sheet date to gather sufficient competent evidence as a reasonable basis for expressing an opinion on fair presentation of financial statements. Examples of tests of balances are confirmation of accounts receivable, physical counts of inventory, and recalculation of pension liabilities, or depreciation on long-term assets. Generalized audit software can be used to perform substantive tests of balances; for example, selecting and printing confirmations. Tests of details of balances can be performed on the ending balances of financial items for both balance sheet and income statement accounts. However, they focus primarily on the balance sheet items. The extent and nature of tests of balances depend on the results of tests of controls, analytical procedures, and substantive tests of transactions. These tests are effective because they often involve the use of external documentation and/or the direct personal knowledge of the auditor, but they are the most costly and time-consuming to perform.

Conclusion

A real-time accounting system enables organizations to keep their financial reports, customer lists, parts catalogs and price lists updated, on-line, and easily accessible to both internal and external constituencies. The use of paperless and real-time accounting systems requires external auditors to employ continuous electronic auditing when most audit evidence exists in electronic form. CA consists of several phases described in this article. Concurrent auditing techniques presented in this paper can be used to collect audit evidence simultaneously as application system processing occurs providing auditors with a viable alternative to using *ex-post* auditing and allowing auditors to implement a surprise testing capability.

The audit process has evolved from the traditional manual audit of an accounting system with paper documentation to the currently used audit methods of auditing around the computer and auditing through computers, and with the emerging information technologies is moving toward the paperless, electronic, on-line, real-time CA methodologies. The new era of improving IT permits auditors to employ CA that acts more as preventive and deterrence

procedures against misstatements of financial statements rather than a corrective method of eliminating misstatements in financial statements that have already occurred. The use of CA enables auditors to set a number of predefined attributes (e.g. snapshot approach, systems control and audit review facility) that continuously select, monitor, and analyze the client's accounting information system and internal control structure and informing the auditor of the problems through alarm systems.

References

- American Institute of Certified Public Accountants (AICPA) (1980), *Evidential Matter: Statement on Auditing Standards (SAS) No. 31*, August.
- American Institute of Certified Public Accountants (AICPA) (1988), *Analytical Procedures: Statement on Auditing Standards (SAS) No. 56*, April.
- American Institute of Certified Public Accountants (AICPA) (1995), *Consideration of Internal Control in a Financial Statement Audit: An Amendment to SAS No. 55: Statement on Auditing Standards (SAS) No. 78*, December.
- American Institute of Certified Public Accountants (AICPA) (1996), *Amendment to Statement on Auditing Standards No. 31, Evidential Matter: SAS No. 80*, December.
- American Institute of Certified Public Accountants (AICPA) (1997), *The Information Technology Age: Evidential Matter in the Electronic Environment*, Auditing Procedure Study, January 1997.
- (The) Canadian Institute of Chartered Accountants (CICA) (1999), *Research Report: Continuous Auditing*.
- Clark, R., Dillion, R. and Farrell, T. (1989), "Continuous auditing", *Internal Auditor*, Spring, pp. 3-10.
- Committee of Sponsoring Organizations of the Treadway Commission (COSO) (1992), *Internal Control-integrated Framework, American Institute of Certified Public Accountants*, September.
- Intacct Corp. (2000), "Web-based audit program is developed with Deloitte", *Wall Street Journal*, June 26, p. A13.
- Koch, H.S. (1981), "On-line computer auditing through continuous and intermittent simulation", *MIS Quarterly*, March, pp. 29-41.
- Rezaee, Z., Ford, W.F. and Elam, R. (2000), "The role of internal auditors in a real-time accounting system", *Internal Auditor*, April, pp. 62-7.
- Zarowin, S. and Harding, W.E. (2000), "Finally, business talks the same language", *Journal of Accountancy*, August, pp. 24-30.