



Continuous Auditing

Evolution of Auditing: From the Traditional Approach to the Future Audit ¹

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Evolution of Auditing: From the Traditional Approach to the Future Audit¹

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Introduction

Auditing is currently at a critical juncture. Specifically, advances in information technology in conjunction with real-time approaches to conducting business are challenging the auditing profession. As such, the primary purpose of this essay is to examine the extent to which the auditing discipline in the United States has advanced and identify the trajectory it might take if it is to continue to thrive and provide long-run value to society at large.

A Brief History of Auditing in the United States

Although auditing procedures have been relied upon for many years, the formal practice of auditing has been in existence for a relatively short period. In addition, emphasis has historically been placed on a periodic, backward-looking approach whereby key events and activities are often identified long after their occurrence or simply undetected. Given that recent developments and technologies facilitated a movement away from the historical paradigm and toward a more proactive approach, it is essential that auditors understand what the future audit entails and how they might begin to envision a logical progression to such a state. To enhance this comprehension, it is advisable to consider how auditing has evolved from its formal beginnings in the early twentieth century.

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The Industrial Revolution and the resulting explosion in growth of business activity led to widespread adoption of auditing methods. The railroads, in their efforts to report and control costs, production, and operating ratios, were major catalysts in the development of the accounting profession within the United States (Chandler 1977). Specifically, firms became aware of the need for mechanisms of fraud detection and financial accountability, and investors increasingly relied upon financial reports as corporations began to participate in the stock market. Although these issues prompted an expansion in the use of accounting and auditing mechanisms, it was after the stock market crash of 1929 that auditing became an obligatory process in the United States.

In particular, the Securities and Exchange Act of 1934 created the Securities and Exchange Commission (SEC). Among other responsibilities, the SEC was initially given authority for the promulgation of accounting standards as well as auditor oversight functions. In addition, the SEC was required to enforce the mandate that publicly traded U.S. companies submit various periodic reports to the agency in a timely fashion. To assist the SEC with ensuring that these reports were created in accordance with generally accepted accounting principles (GAAP), public accounting firms were eventually required to provide certain assurances about the information.

Many of the audit practices existing during the period that immediately followed were not conducted independently and, instead, simply relied upon information from management personnel. Furthermore, refinements of audit standards generally consisted of reactionary measures that occurred in response to significant negative business events. For example, audit tasks such as physical inspection of inventories and confirmation of receivables were optional until fraudulent activities were uncovered at McKesson & Robbins in 1939. As a result, the AICPA issued Statement on Auditing Procedure (SAP) No. 1 in October 1939 and it required that auditors inspect inventories and confirm receivables. Consequently, auditors became responsible for auditing the business entity itself rather than simply relying upon management verification routines.

Following this, auditing by inspection and observation became the norm. Even as automated accounting systems began to appear in the 1950s, manual auditing procedures continued to be used exclusively. For example, in 1954, UNIVAC was unveiled as one of the first operational electronic accounting systems in the United States. However, auditors only began to seriously consider auditing in the computerized context in the early 1960s; two specific events prompted this transition.

First, in 1961 Felix Kaufman wrote *Electronic Data Processing and Auditing*. The book compares auditing around and through the computer. Historically, auditing “around the computer” entails traditional manual procedures in which the existence of automated equipment is ignored. As such, the computer is treated as a black box. In this context, auditors rely upon physical inputs to and outputs from automated devices and do not concern themselves with how processing actually occurs within the system(s). Conversely, auditing “through the computer” involves actual use of computer systems in testing both controls and transactions. Finally, auditing “with the computer” entails direct evaluation of computer software,

hardware, and processes. Consequently, auditing through the computer or with the computer is able to provide a much higher level of assurance when contrasted with auditing around the computer.

Second, International Business Machines (IBM) released its IBM 360 in 1963 and this device made computing more affordable than ever. Clearly, these developments collectively signaled a paradigm shift in terms of how accounting activities were to be conducted in the future and facilitated serious consideration of movement away from the traditional manual audit.

Notwithstanding the progression toward computerized accounting, many auditors continued to audit around the computer and the minority who elected to audit through the computer relied on an array of proprietary programs that were expensive, cumbersome, inefficient, and in need of constant reprogramming. For example, [Cangemi and Singleton \(2003\)](#) mention that in 1967, one firm developed between 150 and 250 unique auditing programs. Furthermore, nearly 80 percent of these programs required significant code modification in the subsequent year because of computer system enhancements and changes in audit requirements. The introduction of AUDITAPE by Haskins & Sells in 1967, a card oriented auditor-friendly computer assisted audit tool (CAAT), encouraged additional auditors to consider moving into the automated domain. In particular, AUDITAPE allowed nontechnical auditors the increased ability to audit through the computer and facilitated the creation of several general auditing software (GAS) programs from 1968 through the late 1970s. In conjunction with the development of these initial audit programs, [Davis \(1968\)](#) alerted auditors to the idea that they would simply not be able to ignore electronic data processing (EDP) in accounting systems when performing audits. In addition, he explained how and when auditing around the computer might be accomplished, but advised that an evaluation of internal controls as both a review and test of system reliability (audit of the computer) would still need to be performed. Davis had a significant and positive effect on the evolution of audit theory and practice. Moving forward, the 1970s saw 2 major developments that dramatically altered the accounting and auditing landscapes.

First, the Equity Funding Corporation scandal of 1973 is sometimes perceived as the single most significant event in EDP audit history. In particular, the organization committed acts of fraud between 1964 and 1973 ([Seidler et al. 1977](#)). Essentially, managers created false insurance policies and commission income to artificially inflate profits and stock price and used a variety of mechanisms to conceal the activities. For example, when auditors attempted to confirm receivables via phone calls to customers, switchboard operators at Equity Funding would simply connect the calls to employees who would subsequently confirm the balance information. When the fraud was eventually unearthed in 1973, Equity Funding had \$2 billion in phony insurance policies and this reflected roughly 67 percent of the total balance in that general ledger account. In reflection, it was determined that an EDP audit would uncover the fraud much sooner. This determination was made primarily because all of the false policies were posted to department number 99, whereas legitimate policies were not applied there.

Whatever the case, the Equity Funding debacle was instrumental in mandating a shift from auditing around the computer. Furthermore, the incident prompted the review of existing audit processes in an effort to address internal controls and audit procedures for information systems. As a consequence, large accounting firms, previously known as the Big 8, established units consisting of EDP specialists to audit information systems. Smaller accounting firms often maintained contracts with information systems professionals to assist in auditing such systems.

Second, the Foreign Corrupt Practices Act (FCPA) of 1977 had substantial implications for accountants. Basically, the FCPA prohibited American companies from bribing foreign officials to obtain business and required these firms to have mechanisms in place to detect such activities. In addition, the FCPA required companies registered with the SEC to maintain their books and records such that transactions were accurately and fairly reported and consistently employ adequate systems of internal controls. Consequently, U.S. companies were forced to implement significantly more robust accounting systems as well as internal controls within those systems.

During the next 25 years, many of the noteworthy events involving auditing of information systems pertained to the development and refinement of automated vendor offerings designed to increase effectiveness and efficiency in auditing. The advancement and proliferation of technologies, such as the personal computer, led to electronic data processing becoming more widespread within organizations (Davis 1968). As an example, the author shows that the number of computers installed in U.S. based companies increased fourfold between 1962 and 1967. Along with this extensive distribution of computing power and security risk came the increasing demand and need for micro-based computer assisted audit tools (CAATS) designed to aid in automating the audit process. In fact, the flexibility and power of CAATS helped to bring improved audit quality and speed when dealing with the increase in data availability associated with automated systems.

In response to the expanding demand for CAATS, vendor-based solutions began to appear in the marketplace and the need for accounting firms to continue developing proprietary in-house audit tools was greatly diminished. For example, standardized audit tools such as Audit Command Language (ACL) and Interactive Data Extraction and Analysis (IDEA) emerged and offered significant advantages over the COBOL-based programs of the previous period. Moving forward, such tools are periodically refined and continue to provide valuable assistance to those seeking to audit through the computer today. Although CAATS have been instrumental in encouraging a shift away from traditional manual auditing, another fairly recent development has also had a significant effect.

Specifically, passage of the Sarbanes-Oxley Act (SOX) in 2002 imposed sweeping changes on publicly traded companies and the accounting profession. SOX established that assurances about internal control practices and operations as well as financial reporting quality were the responsibility of both management and auditors. Furthermore, SOX caused the accounting discipline to devote more attention to addressing fraud during the course of an audit. For example, Statement on Auditing Standards (SAS) No. 99, Consideration of Fraud in a Financial Statement

Audit (AICPA, Professional Standards, AU-C sec. 240), requires auditors to design audit procedures that provide reasonable assurance of detecting fraud that could have a material effect on the financial statements.

As is evident from the preceding discussion, auditing maintains a very interesting past and refinements have occurred progressively along the way that ultimately established capabilities for an improved audit experience. However, barriers continue to exist in evolving toward the future audit. For example, the traditional auditing paradigm whereby transactions are sampled based upon risk considerations continues to be prevalent in the auditing profession today. Unfortunately, this process often fails to maximize utility in the information age. Conversely, the future audit that relies upon the leveraging of technologies and processes has the capability to expand analyses of a firm's operating activities and thus provide improved audit quality. As an example, [Kuhn and Sutton \(2006\)](#) examined fraudulent capital expenditures at WorldCom and determined that, where the manual auditing system failed, a properly structured continuous assurance (CA) system would successfully detect suspicious transactions in a timely fashion. Perhaps with effective CA systems in place, the WorldCom disaster and others like it could have been avoided entirely.

In further support of the future audit, it is estimated that total global fraud losses were more than \$2.9 trillion in 2009 ([Association of Certified Fraud Examiners 2010](#)). More important, this figure continues to rise. Although some aspects of the traditional audit will continue to hold value, the audit of the future provides opportunities to increase the use of automated tools and remains a key for offering improved assurances relative to the responsible management and utilization of stakeholder assets. Moving on, with rudimentary coverage of audit history achieved, focus will now shift to briefly examining the traditional statutory audit and envisioning how it might ultimately evolve into the future audit.

The Traditional Audit

Following the initial establishment of a contractual arrangement between the auditor and auditee, an audit engagement typically proceeds with a risk assessment and formulation of an audit plan delineating the scope and objectives of the audit. Following this, auditors collect and analyze audit evidence and form opinions pertaining to internal controls as well as reliability of the information provided by management. At the engagement conclusion, auditors present a formal report expressing their opinion. In fact, this approach reflects the twentieth century methodology whereby there are high costs and significant time delays associated with information collection, processing, and reporting. However, these historical costs and delays are often not the norm today. Most likely, in the current business realm, transactions are often entered and aggregated such that they can provide near immediate feedback to relevant stakeholders. Furthermore, academicians and practitioners alike recognize this information shift and developed numerous solutions that more appropriately reflect the current business environment.

Automating the Audit

Organizations historically accustomed to manual audit procedures may benefit from pursuing the future audit in an incremental manner. Such an approach would basically result in conducting a pilot study to ascertain the potential benefits of audit automation. Because resistance to change is a universal phenomenon, gradual and careful advancement will likely be a more tractable approach. Moving forward, this might ultimately result in greater subsequent support for expansion of automated audit practices and programs and could significantly improve the chances of success in eventually reaching the future audit.

Lanza (1998) argues that low cost solutions for achieving an initial automated audit experience include introductory CAATS that facilitate data extraction, sorting, and analysis procedures. These programs require little training, have no file size limitations, provide detailed audit logs for use as work paper documentation, and allow for the creation of auditor-specified reports that may be applied to current and future data sets. These tools should be initially used to replace manual audit activities because these are areas where the most substantial benefits might be accrued. For example, the programs could be configured to address tasks such as footing ledgers, choosing statistical samples, generating confirmations, and detecting suspicious transactions. In addition, such tools are capable of testing 100 percent of the records included in a file; this is a marked improvement over the sampling techniques historically found in the traditional manual audit. Through these programs, auditors are able to obtain a better understanding of business operations as well as enhanced levels of expertise and professional skepticism.

In terms of disadvantages, tools in this category do not operate on a truly continuous basis. Specifically, they are batch process programs activated periodically according to the audit plan. As such, although they certainly offer the functionality to improve audit quality, it may eventually be desirable to consider other methods that more closely align with the future audit.

In addition to the preceding software considerations, training issues should be addressed during the process of automating the audit function. For example, Curtis and Payne (2008) argue that although CAATS are capable of improving the efficiency and effectiveness of auditing functions, such tools tend to be underutilized. Accordingly, properly constructed and executed training programs may facilitate more complete adoption and usage of CAATS by practitioners (Janvrin et al. 2008). Adequate training will be an essential component of any audit automation initiative in order to optimize the likelihood that auditing staff will take full advantage of the benefits that automated tools can provide.

A strategically formulated and implemented plan that includes careful consideration about issues of resistance, cost and benefit tradeoffs, project scope, and training should result in more favorable outcomes. At a minimum, CAATS have the potential to serve as a bridging mechanism between the manual audit and the ultimate future audit. If implemented and utilized as intended, significant gains will be realized such that firms should be more open to entertain the notion of venturing further into the arena of automation.

The Future Audit

As previously mentioned, basic CAATS contain capabilities to enhance audit effectiveness and efficiency. However, they do not operate on a 24/7 basis and therefore fail to construct a truly continuous auditing environment whereby exceptions and anomalies may be identified as they occur. Alternatively stated, they do not work with real-time or close to real-time data streams and, thus, are not able to address questionable events such as potential fraud or irregularities in an optimized fashion. [Cangemi \(2010\)](#) argues that, given the recent advances in business technologies, the continuing emphasis on the backward looking audit is simply an outdated philosophy. Instead, he believes that real-time solutions are needed. As such, firms that successfully experiment with the CAATS described previously should give eventual consideration to more advanced programs which contain functionalities resembling the audit of the future and provide a higher level of assurance.

Fortunately, recently proposed solutions better satisfy this vision. In general, the programs in this category contain the capabilities to continuously capture exceptions and outliers in data sets from disparate systems, provide information and alerting mechanisms to relevant personnel in an ongoing manner, and essentially confront issues such as fraud, errors, and misuse of resources in real-time. Furthermore, these programs may assist in optimizing the audit function by analyzing all financial transactions as they occur. As such, this proactive approach increases efficiency and effectiveness in discovering problems and opportunities for business improvement. However, prior to moving into this more elaborate domain, additional considerations relative to business operations are warranted.

In conjunction with this position, [Teeter and Vasarhelyi \(2011\)](#) explain the optimal alignment of enterprise data and audit procedures. For example, they mention that manual data corresponds to manual auditing methods. They also indicate that organizational data that is not strictly manual may be subject to automated audit procedures on some level. Therefore, the more manual data an entity maintains, the less it might initially benefit from audit automation. In order to determine the potential utility of a robust auditing system, an organization should first consider the extent to which its data is automated. Following this, identified manual enterprise data might reasonably be converted to a more automated state prior to implementation of tools for automating the audit process.

In moving toward the future audit, the extent to which data, controls, and processes are automated must be considered. A company that is overburdened by manual audit processes will need to confront this issue at some point if the objective is to yield optimal benefits from the future audit. Essentially, if the organization automates its data, controls, and processes in a manner that properly aligns with the functionalities of the technology being implemented, the business will likely be in a position to optimize audit quality.

An enterprise that moves toward greater automation relative to data, processes, controls, and monitoring tools begins to naturally structure itself for the coming of the future audit. Given the recent advent of the real-time economy, this positioning is critical. For example, the Continuous Audit Monograph ([CICA/AICPA 1999](#))

notes that the development of the digital economy has facilitated a demand from decision makers, such as potential investors and creditors, for more timely notification on a wide array of information topics extending well beyond the traditional financial statements. Therefore, if these decision makers require a more continuous information stream on which to formulate decisions, they will also demand independent assurances about the reliability of that information. Consequently, the need for a 24/7 auditing protocol becomes apparent if firms intend to compete for scarce resources and ultimately succeed in the current and evolving real-time global economy.

With this in mind, one could argue that the traditional manual and retrospective audit is becoming an untenable position. Also, it could be argued that the use of rudimentary CAATS such as those described earlier will eventually be questioned in terms of audit utility. Fortunately, the idea of the future audit is not a recent phenomenon and there are a variety of methodologies that have been proposed to reach this plateau.

Embedded Audit Modules

The embedded audit module (EAM) approach involves the installation of files or code segments within the host system (Groomer and Murthy 1989). For example, in the integrated test facility (ITF) method, a series of auditor-developed “dummy” master files are instantiated in the live client system and test transactions are entered as desired by the auditor. These records are then processed such that only the auditor-created master files are affected. Another example in the EAM domain involves a block of program code that is created and inserted within the client’s system code structure. Under this scenario, the EAM subsequently monitors transactions occurring on the host in accordance with the construction of the code block. When a suspicious item is identified, relevant event information is recorded in a log that the auditor reviews on an ongoing basis. Although these approaches have been proposed for a number of years, several problems have resulted in a lack of acceptance within the auditing community. For example, Groomer and Murthy (1989) point out that the EAM method may reduce client system performance, create excessive data sets relative to the event log, and be subject to code modification by astute programmers. Because of such issues with the embedded approach, it currently exists as primarily an academic topic.

Monitoring and Control Layer

The monitoring and control layer (MCL) architecture is considered a CAAT that may aid in providing continuous monitoring and control of accounting information systems (Debreceeny et al. 2005). Vasarhelyi, Alles, and Kogan (2004) initially introduced the MCL architecture as an alternative to the EAM methodology. In particular, several researchers have pointed out that, in contrast with EAM, MCL has

fewer concerns related to software maintenance, legal liability, client independence, and reliance on enterprise personnel (Alles et al. 2006; Kuhn and Sutton 2010).

In terms of functionality, Best, Rikhardsson, and Toleman (2009) indicate that MCL is essentially a self-governing, middleware solution that extracts data from systems and conducts appropriate analyses as desired. The primary function of the MCL method is to continuously analyze and compare data obtained against specific benchmarks or other criteria. When exceptions are noted, alerts are generated and sent to the auditors for review and investigation. Consequently, the MCL approach is preferable to the EAM methodology on many dimensions, including mutual exclusivity of the auditing module and client system(s).

However, although the MCL approach is superior to the EAM techniques, it is still perceived as a suboptimal solution. For example, Sigvaldason and Warren (2004) indicate that many enterprises maintain a variety of disparate systems and this presents substantial difficulties and challenges in establishing the required connections between the MCL and various client systems themselves. Also, given its inherent status as a monitoring and control solution, some might argue that the maintenance of auditor independence in the MCL environment is inherently problematic. Whatever the case, much like EAM, the MCL approach has not yet received widespread acceptance in practice.

Audit Data Warehouse

The audit data warehouse model has been offered as a viable future audit solution. In particular, this approach appears to alleviate the problems and concerns associated with both the EAM and MCL techniques. By definition, a data warehouse is “a big data pool—a single, company-wide data repository—with tools to extract and analyze the data” (David and Steinbart 1999, 30). Essentially, a data warehouse is linked with the various and disparate enterprise systems such that it readily accepts and integrates the pertinent data being generated throughout the organization (Rezaee et al. 2002). In addition, the data warehouse may be incorporated with data marts, which are a set of smaller, focused warehouses in which each addresses a particular functional area such as accounting or marketing. Furthermore, the audit warehouse and data mart(s) may reside on the same audit server.

From an operational perspective, enterprise data is extracted, converted, standardized, and installed in an ongoing manner within the data warehouse context. In addition, each data mart gathers, transforms, and loads appropriate data from the warehouse according to specifications and configurations. Also, each data mart contains various standardized audit tests that operate at stipulated time intervals (for example, continuously, daily, weekly), collect audit evidence, and generate exception reports for auditor review and investigation.

A conceptual model that utilizes the audit warehouse architecture is AuSoftware. According to Sigvaldason and Warren (2004), it accumulates necessary data on a continuous basis in flat file structures from a disparate array of organizational systems (for example, ERP, legacy, outsourced). To minimize processing burden,

AuSoftware imports data in read only format into a data warehouse or “audit data mart” that provides for continuous auditing procedures. In addition, as suspicious items are identified, the software is able to communicate control and audit alerts via Web-based interfaces or more direct routes such as cell phones. AuSoftware has the capability to identify anomalies and irregularities on a 24/7 basis and alert auditors in an immediate manner such that interventions may occur in a timely fashion. This is a significant improvement over the traditional audit that simply evaluates a small sample of historical transactions and items on a periodic basis and may either fail to identify problems that exist or detect problems too late for adequate resolutions to be implemented.

Audit Applications Approach

A very recent development entails the usage of specific applications or “apps” in conducting the future audit. The AICPA Assurance Services Executive Committee (Zhang et al. 2012) has promoted the idea that a standardized set of data² from multiple cycles be used by a series of audit apps that might be constructed and procured in alignment with audit plans and assertions in order to effectively perform the future audit. For example, for the audit activity “evaluate aging of accounts receivable,” an audit app could be utilized to query accounts receivable transaction details, compare percentages in all aging categories with prescribed industry standards, and alert auditors when the actual percentages vary significantly from the designated standards. Furthermore, additional apps could be created and otherwise obtained as required for completing remaining audit activities in fulfillment of the organizational audit plan and assertions.

Other Future Audit Considerations

The preceding discussion demonstrates that sophisticated audit technologies are being actively researched and developed to facilitate the future audit. However, many organizations will have much to overcome prior to moving toward that realm. For example, the CICA/AICPA (1999) formulated the following listing of six conditions necessary for advancing to the future audit:

- **Subject matter with suitable characteristics.** Highly automated processes are needed to provide reliable information shortly after occurrence of associated events and transactions.
 - Business has progressed substantially in providing close to real-time information for key processes. Their utilization for audit is still spotty.

²The audit data standard predicts a series of flat (or tagged) standard files that are to be provided by companies to internal and external auditors. The general ledger and receivables standards were exposed by the AICPA and are under revision as of the publication date of this paper.

- **Reliability of systems providing the subject matter.** Probability the system will operate effectively over a given period of time; reliability optimized when enterprise controls are effective and system provides complete and accurate information in a timely fashion.
 - Although SysTrust has been out for a decade, it is only now that there is more attention given to assurance on system reliability. This attention is also spotty.
- **Audit evidence provided by highly automated procedures.** Auditors must quickly understand causes of all recognized anomalies and errors, determine where they originated, and discuss corrective action with management.
 - We have not yet managed to provide and use real-time audit evidence.
- **Reliable means of obtaining results of audit procedures on a timely basis.** The outcomes of automated audit procedures must be efficiently communicated to auditors; this suggests reliable and efficient electronic communication methods with appropriate security measures in effect.
 - As discussed in essay 2, “The Current State of Continuous Auditing and Continuous Monitoring,” the external audit profession has not yet adopted “close to the event” audit technologies, although they are in the process of advising internal audit departments on how to do so.
- **Timely availability of and control over audit reports.** Organizational information and associated audit reports must be available in an ongoing manner and easily accessed by legitimate users.
 - Substantive adoption of automated work papers, audit warehouses, and corporate internal report distribution has drastically reduced report distribution challenges.
- **High degree of auditor proficiency in information technology and the audited subject matter.** Auditor must have necessary skill sets to handle the engagement.
 - Pockets of practitioners developed IT skills. Recently there is growing awareness of the need to increase auditor IT and analytic proficiencies.

Therefore, a host of variables and characteristics must be adequately addressed in order to fully realize the benefits of the future audit. Although the system architecture and software components are extremely important considerations, complementary elements such as auditor education, the socio-technical environment of the firm, and tone at the top are fundamental as well. Consequently, comprehensive strategic planning that joins technical issues with human issues is also a necessary ingredient in helping to ensure a successful transition to the future audit.

Conclusion

Auditing has made great strides in the past decade, but it has not seemingly kept pace with the real-time economy. Some auditing approaches and techniques that were valuable in the past now appear outdated. Also, the auditing evolution has

reached a critical juncture whereby auditors may either lead in promoting and adopting the future audit or continue to adhere to the more traditional paradigm in some manner. Future audit approaches would likely require auditors, regulators, and standards setters to make significant adjustments. Such adjustments might include (1) changes in the timing and frequency of the audit, (2) increased education in technology and analytic methods, (3) adoption of full population examination instead of sampling, (4) re-examination of concepts such as materiality and independence, and (5) mandating the provisioning of the audit data standard. Auditors would need to possess substantial technical and analytical skills that are currently not components of most traditional four year university accounting programs.

SOX introduced the first major change in the mandate of the public company audit. This new prescription focuses on auditor assessment of internal controls, a very important step in the assurance of future systems that will be modular, computerized, and often outsourced. The accounting profession now faces an opportunity to further elevate the audit to a higher level of automation. It is imperative that accountants ultimately lead the way in adoption and implementation of the future audit such that they continue to be the professionals of choice relative to audit engagements of the future.

References

- AICPA Assurance Services Executive Committee, June 2011. Audit Data Standards and Apps. University Presentation.
- Alles, M., Brennan, G., and Kogan, A., 2006. "Continuous Monitoring of Business Process Controls: A Pilot Implementation of a Continuous Auditing System at Siemens," *International Journal of Accounting Information Systems* 7 (2): 137–161.
- Association of Certified Fraud Examiners, 2010. Report to the Nations on Occupational Fraud and Abuse.
- Best, P., Rikhardsson, P., and Toleman, M., 2009. "Continuous Fraud Detection in Enterprise Systems Through Audit Trail Analysis," *Journal of Digital Forensics, Security, and Law* 4 (1): 39–60.
- Cangemi, M., and Singleton, T., 2003. *Managing the Audit Function: A Corporate Audit Department Procedures Guide*, 3rd ed. John Wiley & Sons, Inc.
- Cangemi, M. April, 2010. "Internal Audit's Role in Continuous Monitoring," *The EDP Audit, Control, and Security Newsletter* 41 (4).
- Chandler, A. D., Jr., 1977. *The Visible Hand: The Managerial Revolution in American Business*. Cambridge, Massachusetts: Harvard University Press.
- CICA/AICPA Study Group, 1999. Research Report: Continuous Auditing. Toronto, Canada: The Canadian Institute of Chartered Accountants, American Institute of Certified Public Accountants.
- Curtis, M., and Payne, E., 2008. "An Examination of Contextual Factors and Individual Characteristics Affecting Technology Implementation Decisions in Auditing," *International Journal of Accounting Information Systems* 9: 104–121.
- David, J.S., and Steinbart, P.J., December 1999. "Drawing in Data," *Strategic Finance*. 30–36.

- Davis, G., 1968. *Auditing & EDP*. New York, New York: American Institute of Certified Public Accountants, Inc.
- Debreceeny, R., Gray, G., and Yau, W., 2005. "Embedded Audit Modules in Enterprise Resource Planning Systems: Implementation and Functionality," *Journal of Information Systems* 19 (2).
- Groomer, S. M., and Murthy, U. S., 1989. "Continuous Auditing of Database Applications: An Embedded Audit Module Approach," *Journal of Information Systems* 3 (2): 53–69.
- Janvrin, D., Lowe, D., and Bierstaker, J., 2008. Auditor Acceptance of Computer-Assisted Audit Techniques. Working Paper.
- Kuhn, R.J., and Sutton, S.G., 2006. "Learning from WorldCom: Implications for Fraud Detection Through Continuous Assurance," *Journal of Emerging Technologies in Accounting* 3: 61–80.
- Kuhn, R.J., and Sutton, S.G., 2010. "Continuous Auditing in ERP System Environments: The Current State and Future Directions," *Journal of Information Systems* 24 (1): 91–112.
- Lanza, Richard, 1998. "Take My Manual Audit, Please!" *Journal of Accountancy* 33–36.
- Moussalli, Stephanie, October 2005. "Accounting for the Journal's First 100 Years: A Timeline from 1905 to 2005," *Journal of Accountancy*.
- Rezaee, Z., Sharbatoghlie, A., Elam, R., and McMickle, P., 2002. "Continuous Auditing: Building Automated Auditing Capability," *Auditing: A Journal of Practice and Theory* 21 (1): 147–163.
- Seidler, L.J., Andrews, F., and Epstein, M.J., 1977. *The Equity Funding Papers: The Anatomy of a Fraud*. New York: John Wiley & Sons.
- Sigvaldason, T., and Warren, J.D., 2004. Solving the Software Architecture Riddle to Deliver Enterprise-wide Continuous Financial Process Monitoring and "Auditing." Financial Market Solutions, LLC.
- Teeter, R., and Vasarhelyi, M., June 2011. Audit Theory and Assurance Automation. Rutgers University Presentation.
- Vasarhelyi, M., Alles, M., and Kogan, A., 2004. "Principles of Analytic Monitoring for Continuous Assurance," *Journal of Emerging Technologies in Accounting* 1 (1): 1–21.
- Zhang, L., Pawlicki, A. R., McQuilken, D., and Titera, W. R., Spring 2012. "The AICPA Assurance Services Executive Committee Emerging Assurance Technologies Task Force: The Audit Data Standards (ADS) Initiative," *Journal of Information Systems* 26 (1): 199–205.