

*JOURNAL OF EMERGING TECHNOLOGIES IN ACCOUNTING*  
Vol. 13, Issue 1  
Spring 2016  
pp. 000–000

American Accounting Association  
DOI: 10.2308/jeta-51446

# Continuous Audit and Enterprise Resource Planning Systems: A Case Study of ERP Rollouts in the Houston, TX Oil and Gas Industries

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**ABSTRACT:** The use of enterprise resource planning software has become an essential part of conducting business for many small, medium, and large companies. This paper presents a case study of accounting information specialists in different divisions of the same conglomerate in the energy industry in Houston, Texas that engaged in anti-fraud audits following the rollout of enterprise resource planning (ERP) systems by implementing continuous auditing processes (CA). The results indicate that the adoption of an ERP system has a significant impact on the efficiency, fraud risk reduction, knowledge application, as well as the credibility of the auditing team. The most important factors for the successful use of fraud mitigation techniques rely on ERP systems, which have continuous audit functions. The major and minor themes that emerge from the results of this case study are thoroughly dissected and discussed. Future studies of the use of ERP and CA systems to combat fraud should examine how auditing teams can apply superior fraud detection through preparation and training, education, and on-the-job experience.

**Keywords:** audit risk; audit teams; education level; ERP implementation.

## INTRODUCTION

Businesses turn to enterprise resource planning (ERP) software to improve operations through increased accountability and continuous auditing capability that is preconfigured into the programs. Companies like SAP SE and Oracle Corporation have provided businesses with new ways to manage operations with an eye toward financial and human capital. Business leaders can leverage the finer internal control mechanisms that such products allow to reduce fraud and ensure regulatory compliance. Properly implementing ERP can generate challenges in terms of costs, logistics, and security. By using ERP-related tools such as exception reports, M-Scores (a mathematical model of eight financial ratios to identify if a company is manipulating its financial statements), risk scores, and other methods in order to continually improve internal control processes, businesses can benefit from an effective and efficient rollout. This paper presents a case study of an anti-fraud ERP rollout.

Ten members of auditing teams that had the opportunity to work with Continuous Controls Monitoring (CCM) and Continuous Auditing (CA) systems were interviewed. In the world of Internet technology, data and critical information are transmitted constantly across numerous barriers and gateways; therefore, it is crucial to understand how to properly implement information technology systems and use their resources to ensure that no fraudulent activity or security breaches occur. Businesses are particularly vulnerable when shifting from one system or service provider to another, for example, during server migration. The adoption of ERP software is viewed by investors as a positive sign in terms of a firm's financial health (Benco and Prather 2008); hence, many companies have very tightly regimented conversion and turnover procedures to help with this very process, and much research has been conducted with the goal of improving mergers, acquisitions, and conversions. There are several important areas of internal control that must be discussed when attempting to minimize opportunities for fraud and the effects of fraud on an organization. Our case study results show that the successful rollout of ERP systems is predicated on the time, education, skills, and resources of the audit team. Future studies of ERP rollouts should focus on these factors as important variables.

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Editor's note: Accepted by Miklos A. Vasarhelyi.

*Submitted: November 2015*  
*Accepted: March 2016*  
*Published Online: March 2016*

The rest of the paper is structured as follows. The next section is a literature review of relevant ERP literature. The third section presents research methodology. The fourth section discusses case study results, and the fifth section offers conclusions and recommendations.

## LITERATURE REVIEW

### General Benefits of ERP

Businesses can utilize ERP to enhance internal controls and supplement traditional control mechanisms while also identifying the potential risks of ERP usage in terms of fraud or other misuse. As businesses lose 5 to 6 percent of their annual revenues to fraud and misuse by employees and other internal forces (Islam et al. 2011; Omar, Koya, Sanusi, and Shafie 2014, 184), mitigating fraud is critical. ERP tools such as user access controls, exception reports, algorithmically determined risk scores, as well as accounting indicators like M-Scores and other reporting measures, enable effective auditing and fraud prevention. Internal controls act as a safeguard against fraud by preventing the theft of capital, data, or misreporting by demanding high levels of transparency and accountability across the enterprise. Firms of all sizes have leveraged ERP to improve existing internal controls or add additional capacity to proactively monitor fraud or malfeasance using data analysis. These ERP software packages enable businesses to manage assets and liabilities by increasing transparency, thus improving the ability to control purchases, costs, and the movement of capital through an organization. Major vendors of ERP products include SAP, Oracle, The Sage Group plc, Infor, and Microsoft Corporation, while smaller up-and-coming vendors continue to introduce innovative ERP software to the market (e.g., Columbus). In general, ERP products are highly customizable and tailored to an organization's specific goals, including managing compliance and reducing internal fraud. The software can facilitate executives' understanding of current operations, which means that any fraudulent activity becomes more obvious through higher levels of transparency. This allows data to be tracked in real time; accounting discrepancies are obvious almost immediately, rather than remaining undiscovered until a quarterly report or, worse, obscured (Turner and Owhoso 2009).

The costs and benefits of adopting ERP must be weighed, since the average cost for implementation ranges between \$11 and \$17.5 million and it takes nearly two years to complete (Benco and Prather 2008). The proper implementation of ERP requires the use of internal control mechanisms, as well as significant capital and time. Internal controls are important for both firm success and maintaining compliance with regulations (Turner and Owhoso 2009; Morris 2011).

The disclosure of weaknesses in internal controls leads to "turnover of members of boards of directors, audit committees, and top management. Therefore, the correlation between lowered weakness disclosure and ERP usage is notable because it may enable the identification and remediation of internal control weaknesses" (Johnstone, Li, and Rupley 2011, 377).

Bachlechner, Thalmann, and Manhart (2014) propose providing increased support for auditors in cross-organizational settings in more than just the area of technology. The goal of the auditor is to provide a failsafe backup for internal controls and to catch any human errors that may come through or any fraudulent activity ~~that may have been conducted unlawfully~~. Therefore, the auditor is the last defense against actions that could land a corporation in a legal battle, facing fines, or facing even heavier penalties. By providing as much technological and organizational support as possible to auditors, the chances of catching and preventing fraud are greatly increased.

### Specific Benefits of ERP on CA

S. Chang, I. Chang, and Wang (2013) investigated a specific merger and acquisition in order to illustrate how an information systems integration activity proceeded, and whether implementing such a model was successful. It illustrated the connection between high-quality IT management, which is a necessity for proper ERP implementation, and the smooth transition from one system to another. The researchers first focused on identifying what they considered to be critical functions and leveraging techniques before the merger and acquisition and then on evaluating standardization of practices during the process. The authors concluded that it was essential to "keep the uniqueness of the systems of both companies" during the merger process in order to reduce the concerns and resistance to the integration by employees (Chang et al. 2013). Businesses that wish to adopt ERP must identify ways that current internal control mechanisms can be adapted to the data and analysis ERP systems provide, thus enabling a smooth transition toward the effective use of resource planning to identify fraud (Chang et al. 2013, Abstract).

The users of a company's financial information must be assured that internal controls regulate the accuracy of accounting statements, including procedures to detect, disclose, and mitigate fraud. ERP software enables businesses to comply with these requirements by continually utilizing and improving internal controls (Turner and Owhoso 2009).

ERP improves firms' accountability to shareholders, and ensures smooth operations due to internal monitoring and controls. Agency theory, the dominant theoretical model used in corporate governance research, can help to explain how ERP

might lead to benefits in internal controls (Morris 2011). While different levels of management may vie for resources in fraudulent ways an ERP system allows “the use of built-in controls [that] should make it more difficult for agents at all levels to benefit from unobservable behavior” (Morris 2011, 130). The main factor contributing to control weakness that is affected by ERP usage is “accounting documentation, policy and/or procedures.” Additional factors (Morris 2011, 147) include “accounting personnel resources, competency/training” and “material and/or numerous auditor/YE adjustments,” “restatement or non-reliance of company filings,” “restatement of previous 404 disclosures,” “intercompany/investment w/subsidiaries/affiliates issues,” “financial derivatives/hedging (FAS No. 133) accounting,” “tax expense/benefits/ deferral/other (FAS No. 109 issues,” and “and other post-retirement benefit issues.”

Divisions in responsibilities increase the level of internal controls, but small to medium enterprises may lack the personnel resources to fully divide access to business. ERP software can enable businesses to implement the Separation of Duties (SoD) model effectively (Flegel, Vayssiere, and Bitz 2010).

Kim, Nicolaou, and Vasarhelyi (2013) conducted statistical analysis into the impact of ERP systems on audit lag, and found that a firm’s ERP implementation is negatively associated with audit report lag. The authors state that “implementing ERP systems can affect not only various measures of firms’ performances, but also the external audit, which is generally regarded as something independent of client firms’ decisions” (Kim et al. 2013, 85). Findings “imply that the use of ERP systems by client firms may help decrease the audit report lag, but it takes time for the full impact of the firms’ accounting systems to be realized” (Kim et al. 2013, 63).

### Case Studies

A recent case study (Omar et al. 2014) demonstrates that the Beneish model and ratio analysis are good tools in detecting financial statement fraud within an organization place. The Beneish model employs the use of the M-Score, a mathematical model that uses eight financial ratios to analyze whether a company has manipulated its earnings. If an M-Score is higher than 2.22, then the financial earnings records have been artificially manipulated.

When an auditing firm employs a variety of auditors, each with his or her own opinions of and experience pertaining to auditing technology, in order to conduct an audit for a corporation, the success of detecting fraudulent activity is at risk. Vasarhelyi and Romero (2014) conclude that the variation in the use of the auditing technology is unacceptable if errors are to be detected and rectified. The authors further suggest implementing technology support teams as a form of improving internal control and increasing auditor comfort. If carefully developed technologies are being used at the discretion of the individual auditor or are not being used properly, then companies will surely fall prey to fraudulent activity that can have catastrophic repercussions for the entire corporation, as well as the auditing firm.

Islam et al. (2011) also focus on collusion as a possible element that may be exposed through the prodigious use of ERP products. Identifying one weakness of ERP software, Islam et al. (2011) discuss the limitations of red-flagging, versus actually preventing, a fraudulent transaction. Islam et al. (2011) use a SQL-based algorithm to detect whether fraud is occurring based on predefined scenarios that are common to fraudulent transactions.

Lombardi, Vasarhelyi, and Verver (2014, 84) investigate the benefits and challenges in implementing CCM. The authors analyze the CCM program used by a global bio-therapeutic and biotechnology company. The authors contend that the increased interest in controls monitoring has created awareness and addressed practical implementation issues along the way. CCM resulted in better segregation of duties, more efficient matching of documents, and enabled management to plan for more effective and efficient operations of controls in all departments. It should be noted that “continuous auditing and monitoring technology provides a vital function for ensuring the business units and cycles are in compliance with controls” (Lombardi et al. 2014).

Caldwell and Proctor (2009) explain how CCM and CA are new technologies that automate governance, risk, and compliance (GRC) activities. The four types of CCM target SoD, transactions, master data, and application configuration. Oracle and SAP offer significant CCM products, and smaller vendors like ACL Services Ltd., Oversight Systems, Inc., Approva, Security Weaver, and Infogix, Inc. all bring CCM products to the market so that businesses can rapidly implement and monitor internal controls in accordance with legal requirements.

Jeyaraj and Sethi (2008) propose that research be conducted into how ERP systems can be implemented more effectively using systems development methodologies. SAP R/3, Microsoft Dynamics GP, Oracle, and PeopleSoft are the chief ERP products in use by most businesses, and each allows for varying implementation configurations and capabilities when deployed.

Consequently, ERP software clearly provides an edge to auditors looking for anomalous data within an enterprise. When implemented properly, ERP provides a comprehensive view of a company’s status, including transactions, personnel, capital, and other resources.

**TABLE 1**  
**Research Questions and Corresponding Case Study Items**

Research Questions (RQ)	Questionnaire Items
RQ1: A more efficient audit	Questions 6, 8, 9, 28, 29, 35, 36, 37, 41, 42, 43, 44, 50, 56
RQ2: A lower risk of fraud	Questions 5, 7, 17, 19, 20, 45, 46, 49
RQ3: A broader spectrum of knowledge applied	Questions 2, 3, 14, 15, 16, 24, 26, 27, 30, 31, 32, 33, 34, 38, 39, 40, 48, 52
RQ4: The effectiveness of audit results in increased credibility for the rollout team	Questions 13, 21, 23, 25, 47

## METHODOLOGY

This qualitative cross-sectional case study presents issues related to the AIS rollout of Oracle software within four divisions of one conglomerate in the energy industries in Houston, Texas. The four divisions are engaged in: oil/gas exploration, upstream oil/gas, downstream oil/gas, and mid-stream oil/gas companies. One of the authors has worked in the gas and oil industry as a controller and has first-hand experience of the criticalness of efficient and effective data collection and processing. From exploration to final delivery, the system must be capable of giving accurate data because millions, and often billions, of dollars rest on decisions made from data generated from ERP systems; therefore, this research offers academic and practical benefit to the end user. This study is unique in documenting ERP rollout in the oil/gas industry while implementing continuous auditing.

The study conjectures that a team that is balanced between accounting and AIS majors will result in: (1) a more efficient audit; (2) a lower risk of fraud; (3) a broader spectrum of knowledge applied; and (4) the effectiveness of audit results in increased credibility for the rollout team. In order to answer these research questions for the oil/gas industry firms in Houston, Texas, structured interviews were conducted with one chief accounting officer (CAO), two chief financial officers (CFOs), two IT heads, one controller, four audit managers/lead accountants; a total of ten team members. Each of these team members holds some form of professional designation (CPA, CMA, Certified Information Systems Security Professional [CISSP], and four have CPA and CISSP designations). The IT heads and one of the CFOs are dual-certified in both accounting and IT. Each of these managers has occupied the role for a minimum of seven years. Vasarhelyi and Romero (2014, 350) use interviews to examine the use of technology during four audit engagements, finding that “the characteristics of the audit team largely determine the levels of technology utilization” during audit engagements. Similarly, this study utilized a cross-sectional, case-based field study methodology in order to compare and contrast the stated knowledge, attitudes, and practices of management within the four oil/gas industries’ divisions. Our structured interviews were adapted from questions developed by Vasarhelyi and Romero (2014, 363–365). Case study items were grouped according to four Research Questions listed in Table 1.

Note that 11 questions (specifically, 1, 4, 10, 11, 12, 18, 22, 51, 53, 54, and 55) were dual-category questions. The pilot case study included ten structured questions, to which numerous subquestions were added. This structured interview template was used to conduct face-to-face or conference call phone interviews with the study participants. The final version of the questionnaire included 56 questions. The study obtained qualitative information about the use of technology during the rollout, which was coded by and categorized according to the themes that emerge. These data were then compared quantitatively across participants with different AIS/accounting credentials and educational experience. The use of a case study methodology enables greater understanding of the factors underlying the effective use of CCM/CA technologies during ERP rollouts.

The interviews included background biographical/demographic information: the credentials of all involved on the team, years of direct experience, and educational background (AIS major, accounting major, IT major), professional experience/credentials (CISSP, CIA, CPA, and CMA), as well as the number of rollouts that they participated in.

The study can help to ascertain whether the budget or timeframe ran within constraints or over accepted limits during the previous rollout, all else being equal. The study also examined the past and current make-up of the team in terms of educational and professional experience.

This study contributes to the field of accounting information systems by suggesting a restructure of the academic accounting program to direct students toward AIS competency in order to lower/eliminate fraud during rollouts of enterprise resource systems. The pattern toward isolation of AIS from conventional accountancy research and practice leads to problems with real-world accounting, defers the improvement and uptake of novel best practices, and, in general, represents a problem for the current and future state of accounting practice (Vasarhelyi and Romero 2014). In order to draw valid inferences relating

to the AIS qualification versus accounting only, the study participants' responses were coded according to emergent themes, and any differences between those certified in accounting, AIS, or both fields were examined.

Similar to Vasarhelyi and Romero (2014), open-ended questions were used, providing the respondents an opportunity to give direct responses. In addition, interviewees were assured autonomy; therefore, they had no incentive to give socially desirable answers to skew results. Questions used clear language with neutral structure and, thus, are not leading questions that may skew respondents' answers. The participants were picked based on their level of expertise and qualifications. They are from various divisions, allowing the authors to collect a broader spectrum of results. Auditing is a relatively standardized process; thus, these participants represent traits seen in other firms. Furthermore, different from online surveys, the authors conducted a mixture of face-to-face or telephone interviews, thus avoiding response bias. It is worth noting that although this is just one case study, the questions cover a broad range of issues in ERP rollout and continuous auditing.

## RESULTS

The findings of this study largely agree with the existing literature concerning fraud prevention through the use of ERP. The results that follow from the four hypotheses of this study can be summarized into four key areas: efficiency; risk reduction; knowledge application; and credibility. As this is a qualitative study, some of the questions and answers demonstrate overlap in terms of these four major concepts. The following themes emerged from the eight participants' responses concerning the use of CA/CM&AT during the rollout of ERP.

Table 2 presents the results of Research Question 1, which states that ERP systems enable "a more efficient audit." Table 2 indicates that, in addition to being able to acquire a large amount of quality data, the use of CM allows rapid decision making compared to more retrospective methods of fraud detection. All of the participants identified effective data extraction as the primary benefit of using these technologies. Participant J stated that "it was so much easier to gather data." Audit timing and reliability are improved by implementing CA/CM&AT. On a scale of 1–10, the participants rated ease of data extraction as either 7 ( $n = 2$ ); 8 ( $n = 3$ ); or 9 ( $n = 4$ ). Thus, data extraction was evidently made easier by adopting the new system. No participants identified any obvious barriers to using CA/CM&AT solutions. ERP enables quicker data gathering and analysis, particularly by lower-level staff. Participant A stated that a "less [experienced] staff person [could] . . . follow a [template] and have similar results." Similarly, participant H said that "all levels of staff [extracted data] and got the same results."

These answers demonstrate that CA/CM&AT offers multiple benefits over traditional auditing methods that require extensive time and expertise to execute properly. Standardized procedures using flowcharts may explain the latter phenomenon. Clients using ERP provide much superior data for auditors due to greater fraud detection. Teamwork and obtaining data were identified as areas of success. However, the issue of conflicting egos was raised by participants B and G, who stated that "every once in a while you had a little ego come into play as my team has 2–3 coders and [accountants] . . . they can be a bit of a challenge because they are so smart they have a hard time relating to others" and that "there were almost too many smart people," respectively.

Other barriers to consider include cross-platform issues and working with clients' different proprietary systems. Platform harmonization is the main improvement suggested by participants for clients using ERP who are anticipating an audit. Although proprietary systems offer benefits as far as customization and meeting the unique needs of certain businesses, they can cause headaches when upgrading or integrating ERP databases with CA/CM&AT solutions. Increasing the knowledge base of staff can mitigate cross-platform confusion. According to the responses for question 9, auditors would like the ability to test 100 percent of transactions. Although not directly stated, auditing firms that understand how to fully utilize their client's ERP systems will likely reap the most benefits in terms of speed, automation, and optimization.

Table 3 presents the results for Research Question 2, which states that ERP systems enable "a lower risk of fraud." The issue of obtaining accurate and easily interpreted information is particularly relevant when considering whether auditors might rely on whims or opinions, rather than hard data. Participant A stated that the ERP-based systems enable auditors to "extract the data we need and not skew the lines with what we might just want," while participant B agreed, stating that "[the data are] pretty clinical—it is what's reported nothing more nothing less." Participant D stated this plainly in the answer to question 5, remarking that "numbers do not lie." Only participant A noted that false positives had slightly increased. According to the responses for question 45, other ways to improve the use of CA/CM&AT include better education and training for staff, or under-the-hood enhancements in terms of algorithms and speed.

It was noted that the CA/CM&AT system performs quite well and that ERP was so effective that it would be difficult to revert back to old auditing methods. Training, whether educational, professional, or in structured workshops, was highly useful, with participants favoring longer sessions than shorter ones. Every participant identified cost as the barrier to more extensive use of technology, even though they felt strongly that the use of ERP and CA lead to lower risk of fraud.

**TABLE 2**  
**Efficient Audit (RQ1)**

Questionnaire Item	Response(s)
Question 6: Are there any areas in the audit engagement in which you think that CA/CM&AT has increased your efficiency? Are you able to obtain the necessary evidence in fewer hours or with less skilled staff? How has the use of CA/CM&AT affected the nature, timing, and extent of your audit procedures?	Speed of gathering data results in efficiency.
Question 8: What barriers did you find to using the CA/CM&AT tools effectively and efficiently?	No barriers.
Question 9: What do you wish you could do to improve effectiveness and efficiency further?	100% data auditing on all transactions.
Question 28: What factors do you think would promote the increased use of CA/CM&AT among others?	Accuracy and speed of data gathering; Management buy-in; Ease-of-use; Knowledgeable staff.
Question 29: What improvements can be made to make the data extracted from the company's ERP "ready to be used" by the CA/CM&AT tools?	Platform compatibility; Separate systems could reduce potential for internal fraud by preventing employee knowledge.
Question 35: Do you think that the amount of time assigned to training was enough?	No (n = 4); Yes (n = 3); Somewhat (n = 2).
Question 36: Would it be beneficial to have longer training sessions?	Yes.
Question 37: Would it be beneficial to have more sessions with reduced time assigned to each of them?	Yes (n = 2); Probably (n = 4); Not sure (n = 3).
Question 41: If it was difficult to extract the data, describe the difficulties encountered.	<i>Participant B: "the traditional hurdles . . . approval rights . . . password activation";</i> No (n = 8).
Question 42: How do you think the reliability and ease of extracting can be improved?	More coders; Pre-planning.
Question 43: What worked well in the engagement?	Teamwork; Data extraction.
Question 44: What didn't work well? Why?	Ego issues with highly skilled team members (n = 2); Nothing (n = 7).
Question 50: What barriers did you find to using the CA/CM&AT tools effectively and efficiently?	<i>Participant A: "in the past it could have been knowledge base—but not so much now";</i> None (n = 8).
Question 56: To what extent does the current audit methodology and guidance inhibit a fuller adoption of CA/CM&AT tools?	Uniqueness of each system; Knowledge base.

Research Question 3 states that ERP systems enable "a broader spectrum of knowledge applied" to the audit process. The results are listed in Table 4. Participants were evenly split between those with dual degrees (CS/accounting) and those who received on-the-job training. However, dual degrees are perceived as highly beneficial for understanding and using ERP-based auditing and fraud detection systems. In terms of ranking their own abilities, slightly more than half of those interviewed felt they possessed above-average (or, as participant B stated, "B+") accounting/CS skills. Participant F identified as an expert, and no participants identified a level of experience that was below average.

The remaining participants possessed average or intermediate skill levels. Time and training are identified as problematic, based on the responses to questions 38 and 39. Participant B recognized problems common to any IT implementation, such as user access control. Participants A and E stated they had "no idea" whether their firm's use of CA/CM&AT was comparable to other auditors. This represents a possible avenue for future research, as auditing firms must ~~to~~ remain competitive as technologies and techniques change over time.

**TABLE 3**  
**Lower Fraud Risk (RQ2)**

Questionnaire Item	Response(s)
Question 5: Are there any areas in the audit engagement in which you think that CA/CM&AT has increased your effectiveness? How has it improved the quality and reliability of the evidence obtained?	<i>Participant D: "numbers don't lie";</i> Accurate data without bias.
Question 7: Has the number of false positives increased?	No; Slightly (n = 1).
Question 17: Do you think that the quality of the tools is appropriate?	Yes (n = 6); Probably (n = 3).
Question 19: (If the background information reveals that the client changed their systems or introduced new ones) What has been the impact on the company's business processes of the change in the ERP system?	<i>Participant A: "change brought initial challenges, but after running dual systems for 2 [quarters] the data is obtained much faster so if there is a problem [then] correction can [occur] faster";</i> Initial hurdles then smooth.
Question 20: Comparing this client with others who are not using ERPs, do you think that the data provided by the client on this engagement were more reliable?	Yes/Absolutely.
Question 45: How could the CA/CM&AT features be improved?	Speed; Algorithm; Staff knowledge/training.
Question 46: What do you think has to be done to increase the extent to which teams rely on CA/CM&AT?	Nothing as current staff is knowledgeable.
Question 49: Comparing this client with others who are not using ERPs, do you think that the data provided by the client on this engagement were more reliable?	Yes/Absolutely.

Table 5 presents results for Research Question 4, which states that "the effectiveness of audit results in increased credibility for the rollout team."

**99** **Table 4** indicates that experience, precision of the audit teams, and the fact that they had worked together on prior audits improve audit effectiveness. A secondary benefit was the fact the ERP system could process larger volumes of data with greater speed. This allowed the timing of procedures to be modified according to the needs of the auditor to maximize efficiency, as well as effectiveness. Since cost continues to be a factor in ERP rollouts, the ability to modify the nature, timing, and extent of the audit using CA/CM & AT tools only helps to strengthen the effectiveness of the audit. The authors feel that this finding strengthens the need for CA in ERP system rollouts. Last, the findings support that the effectiveness of the audit is due, in part, to the continuation of the audit team.

### CONCLUSION AND LIMITATIONS

Overall, this case study demonstrates how ERP benefits businesses by introducing greater levels of transparency and efficiency throughout the organization and exposing corporate fraud. The use of a case study methodology enables greater understanding of the specific factors underlying the effective use of CCM/CA technologies during ERP rollouts.

Based on this case study, anti-fraud ERP systems can be rolled out successfully through a combination of skills, time, and teamwork. ERP is an invaluable tool for businesses that need to comply with federal and international accounting standards and practices, because it offers increased monitoring, reporting, and risk identification, as well as the enhanced implementation and meta-analysis of internal controls. ERP solutions from vendors such as SAP, Oracle, and Microsoft can help businesses conduct internal audits and report accurate information about the financial status and health of the firm. Although this study was limited to Oracle software, companies and auditing firms considering rolling out fraud detection in conjunction with ERP should be aware of the multiple systems available. ERP systems can help to reduce fraud by facilitating internal controls, but must be implemented properly in order to be effective.

The participants of this study identified clear benefits and barriers to the use of CM/CA&AT. The benefits of speed, reliability, standardization, and access to data may outweigh the major barrier of cost and the more modest barriers of

**TABLE 4**  
**Broader Knowledge (RQ3)**

<b>Questionnaire Item</b>	<b>Response(s)</b>
Question 2: How would you rate yourself and the team as a user of technological tools?	Average (n = 3); Above Average (n = 5); Expert (n = 1).
Question 3: How easy was it to extract the data from the client's system?	7 (n = 2); 8 (n = 3); 9 (n = 4).
Question 14: Did the tools require any special technology to run?	No.
Question 15: Describe the process used to run the tools.	<i>Participant B: "pretty [basic]—follow directions and flow [chart]."</i>
Question 16: Do you think that the audit firm is ahead or behind its key competitors in the use of these tools?	Not sure.
Question 24: Is the client planning to change the ERP system? If so, are the availability of CA/CM and the ease of providing data to an internal or external auditor factors in the purchase of the system?	No/Already changed recently (n = 6); Yes, in future (n = 3).
Question 26: Did you use the CA/CM&AT tool to automate existing audit procedures?	Yes.
Question 27: Did you design new audit procedures to take better advantage of the features of CA/CM&AT?	<i>Participant A: "more detailed flow charting";</i> Evaluation.
Question 30: How would you modify existing audit procedures (in timing, nature, or extent) to increase the utilization of technology in the audit?	Dual systems (n = 4); Nothing (n = 5).
Question 31: Were you trained in the use or interpretation of CA/CM&AT?	Yes (n = 7); No (n = 2).
Question 32: What kind of training did you have?	Dual Degree; On the Job Training.
Question 33: How was your training experience?	<i>Participant F: "credit my education to success."</i>
Question 34: Did it equip you with the knowledge you needed to use the technology?	Moderately (n = 3); Definitely (n = 6).
Question 38: What difficulties did you find in the training process?	<i>Participant B: "time restrictions"</i> (n = 8); Workload (n = 1).
Question 39: What could be changed to increase your knowledge of the systems during training?	More time (n = 7); Small group/One-on-One (n = 2).
Question 40: What was the process used to extract the data from the client's systems?	List/form to client (n = 2); Direct access (n = 7).
Question 48: What are the barriers to more widespread use of technology?	Cost.
Question 52: Did you design new audit procedures to take better advantage of the features of CA/CM&AT?	<i>Participant A: "more detailed flow charting";</i> Evaluation.

increasing employee knowledge and engagement in the training and implementation process. According to the participants' responses, advanced education, such as dual degrees, empowers employees to have confidence in their understanding of new technologies or auditing processes.

This is one case study and it only provides an attempt at understanding the relationship between ERP and continuous auditing. This limitation can be addressed by future studies that may encompass broader aspects and a bigger sample. To the extent that our methodology of conducting interviews inherits any potential weakness in reliability and validity, the generalizability of our finding is constrained. Further studies can help strengthen the case for more Accounting Information System courses to be added to the accounting curriculum so future auditors are better prepared. For example, studies can compare the knowledge base, as well as job performance, of three categories of accounting graduates: (1) those with dual accounting and AIS degrees; (2) those with a single degree, but additional AIS credit hours; and (3) those without additional AIS courses. Future studies can also analyze additional ERP implementations in various industries.



TABLE 5

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## Increased Credibility (RQ4)

Questionnaire Item	Response(s)
Question 13: Were the tools run by specialists or by the audit team?	Participant B: "the audit team and my team are comprised of specialists"; Audit team.
Question 21: Are you able to modify the extent, timing, or nature of your audit procedures as a result of the reliability of the data from the ERP system?	Timing and reliability.
Question 23: Are you able to modify the extent, timing, or nature of your audit procedures as a result of the CA techniques used by internal audit?	Participant D: "yes, because we have a super staff"; Yes/Absolutely.
Question 25: Were you able to modify the nature, timing, or extent of your audit procedures as a result of the CA/CM&AT tools used?	Yes.
Question 47: What will you do next year?	Work with the same team.

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