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Enterprise Resource Planning (ERP) Software Implementation Impacts on the Auditing Activities

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ABSTRACT: Today's the clients of auditors use a variety of IT systems such as Enterprise Resource Planning (ERP) to process accounting transactions. These systems have brought about changes within the organizations. ERP systems developed a new audit landscape requiring auditors to adjust audit processes, controls, and tests. This paper examines how implementation of ERP changes audit process and quality using empirical evidence gathered from auditors experienced auditing in organizations implemented ERP systems. Results indicate improved audit quality for the reason of reduced substantive tests in auditing organizations with ERP systems. However, findings show increased control risk with auditing ERP implemented organizations that decrease perceived audit quality.
Keywords: Enterprise Resources Planning (ERP), Audit Quality, Audit Process, Substantive Tests, Control Risk

INTRODUCTION

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Recent changes in the business environment have suggested the needs for new ways to accomplishment and advancement of organizations' functions. In this way, information technology (IT) provides the necessary tools for organizations to effectively and efficiently response. On the other hand, organizations remain competitive and up to date with new IT systems (Palaniswamy and Frank, 2000). An example of such IT systems is enterprise resource planning. ERP systems have become important in new business as businesses endeavor to maintain competitive advantage in a growing business environment. An ERP is an integrated enterprise-wide computing system. It incorporates a set of business modules employed to support general business tasks. (Kavanagh, 2001). The core concept of an ERP is automation business processes and sharing common data across the enterprise.

The conventional information systems suggest transaction processing and reporting process for decision making, but this is not adequate in the new business environment. Modern business operations for effectiveness, efficiency and business success need automation and real-time data. ERP systems improve the decision-making process by providing appropriate and timely information. ERP systems, moreover, improve planning and control functions in business operations.

According to Parr and Shanks (2000), ERP systems have two main characteristics: first, it establishes a relationship between a model of business processes and the software implementation of those processes, and second, it provides a level of integration, incorporation, data integrity and security. ERP systems construct a central data repository with necessary controls and reporting standards (Ignatiadis & Nandhakumar, 2009). ERP systems prepare an enterprise with competitive advantages to improve business performance by integrating supply chain components and facilitating human resource management, customer orders management, inventory management, production planning and management, accounting, shipping, and all other activities that carry out in the business (Kalling, 2003). In turn, it accordingly leads to customer satisfaction (Gupta, 2000).

ERP implementation brings about important changes across the organization, for example, it reorganizes organization structure (Al-Mashari and Zairi, 2000), affects culture (Soh et al., 2000), redesigns information strategy (Rizzi and Zamboni, 1999), and integrates information systems (Tanis and Fenema, 2000). These studies showed that ERP implementation is a very complex process, involved many organizational functions and conclude that further research should be conducted to investigate organizational areas that are influenced by ERP implementation.

According to Gibbs and Keating (1995), the cross-functional scope of ERP systems can result in increased business risks and the possibilities of financial statement misstatements, and embezzlement. Auditors that have traditionally

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concentrated on legacy processes recognize that controls and processes in ERP environment have changed and shifted from discrete manual involvements to continuous computerized participations. These process changes surge across the organization and auditors should adjust to these changes as both risks and benefits are diffused in an ERP system. Given that auditors' participation and their opinion about organizations situation are very important for stockholders, ERP-driven changes and their impact on the auditor's practices and audit quality become central to an audit engagement (Brazel, 2005).

The purpose of this study is to find empirically evidence via a questionnaire on the effect of ERP systems for organizations implementing them, on their auditing processes, as part of business processes. The focus of this study is to clarify the extent to which ERP systems implementation have affected auditing procedures, control risks and substantive tests. These elements in this study are examined as determinants for audit quality.

This study is organized in five sections as follows: The second section highlights the statement of the theoretical framework and analyzes the literature review related to the ERP systems implementation and its association to auditing processes and practices. Moreover, this section illustrates the research model and addresses research questions. Section three introduces the methodology of the current research. In section four, the main results of the data analysis will be demonstrated and discussed and finally, the last section is the conclusion of study and recommendations for further research will be presented.

Literature Review and Theoretical Framework

IT is playing an important role in virtually business environment. Auditors are encountered with the huge challenge of working and keeping up to date with such complicated environment. ERP systems are one of such modern technologies used by a variety of organizations to attain a strategic advantage. ERP systems construct integration of information through automation of business processes. This is different from the conventional information flow in an organization where data is typically amassed in a separate functional department. ERP systems provide real time information by a synchronized set of modules and result in an asymmetric break between the accounting and audit processes by eliminating conventional controls, which auditors rely on. With this integrated systems, the auditors need to additional direction for audits in an ERP environment. Auditors encounter with many challenges of auditing in business environment with complicated IT systems where processes are merged and control mechanisms are hard to understand. Because, auditors rely on different audit tools and IT applications to capture information from the system.

According to Hunton et al. (2004), auditors should be conscious of audit risks associated with ERP systems. Bae and Ashcroft (2004) asserted that ERP is usually involved with removal of conventional controls without sufficient substitute. Auditors customarily rely on the control mechanisms for efficient and effective audit evaluation. It is necessary for auditors to recognize the ERP environment for quality audit assessment. Covaleski (2000) stressed that auditors should understand the value added by ERP systems and they need to be proactive and technology savvy to audit in this stylish environment.

The literature review of IT auditing provide a general picture of IT audit and also ERP systems audit. Booth et al. (2000) studied information systems effects on accounting role. They examined the level of information system integration and the effect of ERP systems on the accounting practices. They investigated the benefits and the adoption or non adoption of new accounting practice. The research was carried out using a questionnaire with samples of organization with and without ERP systems. The findings showed a high level of satisfaction with ERP systems for transaction processing. Furthermore, their finding was remarkable because it showed the fact that the use of stylish technology did not change accounting processes. This finding confirmed Lilly, R.S (1977) who stated that emerging computer do not change accounting theory as it relates to the way in which such data should be collected and organized for reporting purpose.

Bierstaker et al. (2001) examined the impact of technology on audit process. They investigated the present impact of IT on the audit process, and the prospect implications of IT development for the auditing profession and studied how IT has affected audit planning, testing and documentations. They held interviews with IT professionals from three accounting firms. They attempted to learn which IT technologies were currently being utilized in organizations auditing and to explore auditors' plans for IT applications. They realized important changes in every stage of the audit process. Their study indicated that ERP packages should be equipped with various advanced control such as logging capabilities, security tool, the performance comparable ability, and the capacity to trace transactions.

Bierstaker et al. (2001) also found that the audit is transferring from manual detection to technology based prevention. They recognized important changes in audit processes while new IT applications emerged. This result was consistent with Yang and Guan (2004) who pointed out that although the audit objectives are same for both computerized and non computerized business environment, but the auditing methods and procedures are different.

Yang and Guan (2004) study is an interesting and significant because it revealed the effect of IT applications and systems on audit profession and standards. They investigated the development of IT auditing and internal control standards in financial auditing and argued the control and standard significance for the auditing profession. The study used an exploratory approach to study IT audit standards issued by the AICPA and ISACA and how these standards influence auditing and internal controls. Yang and Guan (2004) concluded that standards are emerging to bridge the gap of technological advances. Furthermore, they observed that rapid growth of technology would lead to more directions to help auditors in examining

financial statements in an IT environment. The study indicated the necessary for auditors to be sufficiently prepared when auditing IT environment.

In the other study, Sia et al (2002) examined the effect of ERP implementation on organizational control. They tried to determine whether the implementation of ERP system constricted management control. The study conducted a single case study of a restructured hospital and the survey was carried out using a questionnaire of 260 users. In addition, interviews with 23 people were also administered to complete the questionnaire survey. The finding of study indicated that users were quick to determine the panoptic control with ERP systems and it obviously affected their perceptive of the system. Moreover, the study concluded that ERP had a probability of perpetuating management power.

Wright and Wright (2002) research was to examine the risks associated with ERP systems. They administrated semi structured interviews with 30 experienced IS auditors from 3 big firms who specialized in evaluating ERP systems risks. The finding illustrated that the implementation of ERP systems had a significant effect on system reliability. They revealed that security protocols and access controls were correlated to the ERP risks and therefore business risk and financial statement error may be extended if access control is not sufficiently considered with ERP implementation. Moreover, Wright and Wright (2002) study indicated that control risk could potentially increase with the ERP systems and these risks are different according to ERP vendors. Their result was also achieved by Girard and Farmer (1999) that noted that ERP systems increased audit risk at many organizations due to "integrated relational database" and "automated interdependencies" among business processes.

Spathis and Constantinides (2004) investigated the impact of ERP systems implementation on accounting processes. The researchers attempted to examine the degree to which ERP system assisted organizations focusing on changes in accounting practices. The study was carried out through questionnaire survey. The survey was conducted through organizations that had implemented ERP system. The finding indicated important changes in accounting practices resulting from ERP systems implementation. The result revealed that the ERP adoption empowered a number of organizations to provide financial ratio analysis, profit centers, allocating costing, the production of budgets and profitability analysis per customer. These changes also stem from the accessibility of real time data and integrated application. Spathis and Constantinides (2004) found a correlation between accounting and ERP systems. They also showed remarkable changes in internal audit functions and recognized that ERP adoption lead to a rise in internal audit function usage.

Bae and Ashcroft (2004) in their research discussed most important IT and accounting issues in the implementation of ERP systems concentrating on information integrity and audit issues. The study utilized an exploratory approach by examining ERP software and how diverse modules within the software afford audit control and information security. Bae and Ashcroft (2004) recognized that as auditors need to assess internal control of clients' business, then auditors should understand the clients ERP systems. Furthermore, they stated that ERP systems if not appropriately implemented could increase the audit risks and remove internal controls.

Brown and Nasuti (2005) utilized a review of literature with a view to ERP system, its framework and compliance with the Sarbanes Oxley (SOX) requirement. They attempted to recognize how ERP systems assisted SOX compliance. The study revealed that ERP systems had competencies to compliance SOX and this compliance will allow auditors to make decision on the efficiency and effectiveness of internal control.

Debreceny et al. (2005) examined the capacity of ERP systems to host embedded audit modules for substantive tests and assessment of control processes, thus, the feasibility of implementing embedded audit modules within the ERP systems were evaluated. The result revealed variation in support of Embedded Audit Modules in different ERP systems and it was found that each ERP system provider had functionalities affecting auditor's assessment. The finding indicated that implementation needed an extensive auditing, business process and technical knowledge and auditors need to rely on the client's technical staff to implement the embedded audit modules.

Sutton (2006) in his study using an exploratory approach examined the development of enterprise systems in accounting and the impact of these systems across different discipline of accounting. The research indicated that enterprise systems have considerably transformed financial accounting processes and as these processes become faster and timely, the reality of continuous reporting would become more likely.

Sutton argued that growth of enterprise systems is diminishing the role of managerial accountants in value and they now add value in their ability through understanding changes that cause strategic goal and operational efficiency. Furthermore, the study noted that enterprise systems have affected audit and assurance services and auditors are adjusting very weakly to these changes. Auditors need to be dynamic and technological enhanced in order to encounter with these changes. In addition, it was asserted in this research that systems reliability assessment has became an inevitable part of the audit service with emerging enterprise systems.

IT evolution have affected the accounting and auditing practices in organizations. Biersktaker et al. (2001), Yang and Guan (2004), and Sutton (2006) all confirmed that auditors need a diverse method and procedure for auditing in a technology driven business environment. Bierstaker et al. (2001) revealed that auditing approach changed in every stage of audit process and auditing would shift from manual detection to technology based prevention as new technologies emerged. Furthermore, Yang and Guan (2004) observed that rapid growth of technology needs more guideline to help auditors.

Booth et al (2000) found that ERP system result in enhancements in several areas of accounting but did not lead to new accounting practice and accounting theory, rather an a change in method. Spathis and Constantinides (2004) stated that ERP implementation improved financial analysis streaming from availability of real time information. They concluded that although ERP system did not cause significant changes, however, it provided timely information resulting in enhanced decision making. Spathis and Constantinides (2004) also asserted that ERP systems improved audit functions in an organization and found a positive correlation with internal audit functions and ERP systems.

Many studies have asserted that ERP systems increase audit risk in organizations. Wright and Wright (2002), and Hunton et al (2004) stated that control risk increased with ERP implementation. Girard & Farmer (1999) in their study argued that ERP systems increased audit risks due to automated interdependencies and integrated relational database. Further et al. (2004) in their study stated that auditors required understanding ERP systems to conduct an effective audit. They concluded that if ERP systems are not appropriately implemented, audit related risks could be increased and internal control systems could be compromised.

Although some studies asserted that ERP systems lead to audit risks, however, some researcher suggested that ERP systems improve audit processes. Brown and Nasuti (2005) in their research suggested that ERP systems have the competence and control mechanisms to support SOX compliance. Also, Berstaker et al. (2001) found a similar result in their study and suggested that as auditing software's becomes integrated into audit process, auditors would have more time to address their clients' complex issues. In addition, Debreceny et al. (2005) asserted that ERP systems had support mechanism for Embedded Audit Modules. Embedded Audit Modules could help auditors in auditing in a complicated information system platform.

Although, pervious studies identified that implementation of ERP systems created changes in audit approach. However, the researches did not state what changes were and how they influenced auditing practices. There is need for researches to examine the changes associated with ERP implementation to determine whether such changes are correlated with audit procedures and practices. This study augments the previous research in this area with examination of ERP systems impact on auditing in three aspects (audit procedures, control risks and substantive tests). Furthermore, this study tries to relationship between affected audit procedures, control risks and substantive tests by ERP adoption and audit quality. Actually, the research attempts to find relationships between audit quality and implementation of ERP systems. Figure 1 shows the examined relationships between variables in this study.
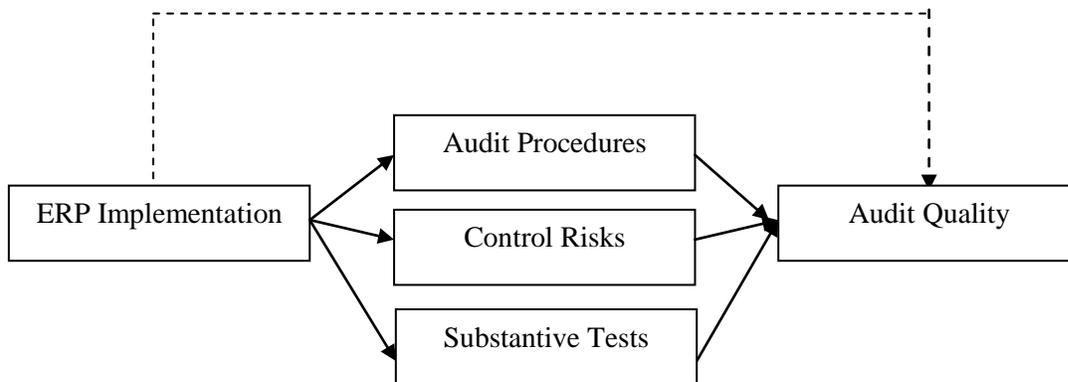
Figure 1. Research model

Research Hypothesis

This study empirically explores the impact of emerging ERP systems for the auditors' activities in Iran organizations. The current study explores and investigates the following research questions:

Organizations with high quality implementation of ERP system are more likely to have high quality level of audit procedures.

Organizations with high quality implementation of ERP system are more likely to have high degree of control risks.

Organizations with high quality implementation of ERP system are more likely to have high quality of substantive tests.

Organizations with high quality implementation of ERP system are more likely to have high level of audit quality.

Affected elements of auditing by implementation of ERP systems improve the level of audit quality.

Research Methodology

The data for this study were collected using a self-administered questionnaire designed to measure the ERP implementation, the quality level of audit procedures, the degree of control risks, the quality of substantive tests, and the level

of audit quality. The respondents should tick one of five rank ordered answer choices that best describe their perception of their organization implementation of ERP system and other research variables in this research.

The questionnaire was pre-tested on a number of academic staff and auditing practitioners, and was piloted on a selected sample of internal auditors in Iranian organizations before administrating the real survey. Comments were considered in developing and amending the final copy of the questionnaire used in the survey.

Seven hundred and fifty copies of the questionnaires were randomly distributed on different organizations (Manufacturing companies, merchandising companies, banks, oil and gas companies, governmental units, and others) in the main cities in Iran. After excluding invalid questionnaires, the survey concluded with three hundreds and thirty eight usable questionnaires. Two hundreds and four respondents declared that their organization do not use any ERP system then were excluded. Finally, One hundred and thirty four questionnaires selected for examination and analysis (Table 1).

In this study, content validity and reliability tests were examined. The measures are pre tested by both practitioners and academics to improve the content validity of the instrument and also a reliability test was carried out on the collected data using the Alpha Cronbach model, to explore its internal consistency of the questionnaire. The result of the reliability test indicates that the questionnaire design is moderate to high reliable, and the collected data are reliable and consistent (Alpha = 0.753).

RESULTS

Correlation and regression analyses were carried out to analyze collected data and examine the significance of the relationship between ERP implementation and auditing related variables in this study. The collected data was processed using the Statistical Package for Social Sciences (SPSS) version 17. Descriptive statistics of the collected data was analyzed for the purpose of understanding the research sample and main characteristics of the research variables. The collected data show that 31 of the respondents were manufacturing companies (Table 1), while, 25 respondents were merchandising companies and 6 of the respondents were banks. 17 respondents belonged to oil and gas industry and 9 respondents were from the governmental sector. Finally, 46 respondents belonged to other organizations, such as hotels, furnishings and carpentry firms, publishing and printing organizations, construction companies, and design organizations.

Table 1. The Research Sample

Distributed questionnaire	750	Manufacturing companies	31
		Merchandising companies	25
Returned usable questionnaire	338	Banks	6
		Oil and gas industry	17
Questionnaire from not ERP implemented organizations	204	Governmental sector	9
		Other organizations	46
Questionnaire from ERP implemented organizations	134	Total	134

The correlation analysis in Table 2 indicates positive correlations coefficient between five related variables of auditing and ERP implementation. This indicates that ERP implementation is interrelated with auditing activities. In explanting the relations between them, there are conceptual and practical reasons. The underlying assumption is that ERP implementation affects organizational data quality and quantity therefore, changes financial and accounting data that are work materials of auditing.

The results in Table 2 shows that ERP implementation is significantly correlated with the quality level audit procedures ($r = 0.282$). Audit procedures are auditors' techniques in collecting auditing evidence to substantive the reliability of the accounting data (Gray and Manson, 2007). Examples of auditing procedures are observing assets to confirm existence and amount, gathering independent confirmations from external parties (e.g., bank confirmation). Previous studies (Biersktaker et al., 2001, Yang and Guan, 2004, and Sutton, 2006) showed that computerized business environment needs a different method and procedure for auditing and this study confirms the relationship between audit procedures and ERP systems.

Girard and Farmer (1999) and Wright and Wright (2002) revealed that control risks are potentially increased with the ERP systems implementation. In simple words control risks are the probability that a significant misstatement occurs in an assertion because that misstatement was not either prevented from entering organization's financial information or it was not revealed and corrected by the internal controls of the organization (Gray and Manson, 2007). This study, the association between control risks and implementation of ERP systems is confirmed ($r = 0.418$).

Substantive tests are those activities performed by the auditor to detect material misstatement at the assertion level. The three forms of substantive tests are: 1) tests of transactions, 2) tests of balances, and 3) analytical review procedures (Gray and Manson, 2007). It is assumed that the amount of substantive tests increases with the implementation of IT applications and ERP systems and the quality and the features of way substantive tests are conducted are affected by applying ERP systems.

The result of correlation analysis in Table 2 reveals this relationship between quality of substantive tests and ERP systems implementation (r = 0.474).

ERP-driven changes and their impact on audit quality become central to an audit engagement (Brazel, 2005). Since the purpose of an audit is to provide assurance on financial statements, audit quality is the probability that financial statements contain no material misstatements (Krishnan, 2003). Although, there are many elements that determine the quality of audit, however, in the modern business environment, audit quality is associated to IT applications such as ERP systems. This relationship is confirmed by correlation analysis in this study and the result shows significant correlation between audit quality and implementation of ERP systems (r = 0.227). The results in Table 2 also indicate the relationships among audit variables studied in this research. There are positive and significant correlations among all variables except between audit procedures and control risks and also there is negative and significant correlation between audit quality and control risks.

Table 3 presents a set of regression analysis with audit procedures, control risks, substantive tests and audit quality as dependent variables and the ERP systems implementation as independent variables.

Table 2. Pearson bivariate correlations between variables

Variables	(1)	(2)	(3)	(4)	(5)
ERP Implementation (1)	1				
Audit Procedures (2)	.282**	1			
Control Risks (3)	.418**	.132	1		
Substantive Tests (4)	.474**	.176*	.311**	1	
Audit Quality (5)	.227**	.184*	-.164*	.210**	1

* Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed).

Table 3. Regressions Results

		Independents							
		ERP Implementation							
		Beta	S.E.	t Value	p Value	R^2	Adjusted R^2	F	Sig. F
Dependents	Audit Procedures	.277	.079	3.915	.000	.077	.072	15.32	0.000
	Control Risks	.407	.072	6.062	.000	.166	.161	36.75	0.000
	Substantive Tests	.480	.070	7.441	.000	.230	.226	55.36	0.000
	Audit Quality	.219	.082	3.046	.003	.048	.043	9.28	0.003

The effect of ERP systems implementation on dependent variables could be examined through linear regression analysis and all the regression models deduce to have significant F ratios (p-value < .003). The results of Table 3 indicate that organizations with implementation of ERP systems are more likely to have high quality level of audit procedures. Yang and Guan (2004) and Sutton (2006), evidenced that different method and procedure is required in performing an audit in ERP environment. Bierstaker et al (2001) demonstrated important changes in every stage of the audit process. Bierstaker et al showed that organization with IT platforms provided auditing capabilities and efficient control tools. Auditors could provide wide range of services to their organizations with utilization of ERP system applications.

According to the results of regression models in Table 3, control risks are affected by implementation of ERP systems. Previous study has distinguished audit risks caused by ERP implementation. Audit risks arise due to the integrated program logic and business process intrinsic in ERP system and software. Bae and Ashcroft (2004) and Wright and Wright (2000), discussed that ERP systems increase audit related risk in organization because of automated interdependencies and integrated relational database. Bae and Ashcroft (2004) stated traditional controls are usually crossed out without replacing with new controls. This happens because data is shared across the ERP modules therefore some traditional controls are no longer needed and there is requirement for new controls.

Bierstaker et al (2001) asserted that ERP implementation will result in decreased substantive testing. It was perceived that IT applications provide powerful auditing tools that help auditors to conduct substantive tests. The results in this study also provide evidence that the quality of performing substantive tests in ERP computerized environment is better than non computerized environment. The integration of business processes across functional areas of organization and accessibility of data and information through ERP implementation, all type of substantive testing could be conducted easily and any those were needed.

Spathis and Constantinides (2003), argued that ERP implementation provide real time data and information that facilitate real time reporting. It was indicated that ERP systems provided benefits such as increased efficiency of transaction

processing, more accessible information and greater support for special reports. Moreover, Bae and Ashcroft (2004) revealed that ERP lead to continuous real time reporting. Using real time data could enhance efficiency and effectiveness when auditing in an ERP environment. Following these studies, this research based on the results in Table 3 confirms that implementing ERP systems improve audit quality. For example, ERP systems provide tracing capabilities that can follow a transaction throughout the organization departments and that this improve business control. Moreover, ERP system had the competencies and technological capabilities to support and compliance rules and regulation such as SOX requirements (Brown and Nasuti, 2005).

CONCLUSION

The study tried to demonstrate if there are changes in auditing practices and process as a result of ERP implementation. The result of this empirical study found out that there are important changes due to ERP implementation. The study has obviously revealed that control risk is increased after ERP implementation and auditors need to consider new audit procedures to manage these kind risks. This implies that auditors should change the traditional audit process and procedures in order to perform audit in an ERP implementing organization. In addition, this study realized that ERP implementation influences the level of substantive tests performed in an audit process. It found that auditors conduct more quality substantive tests in ERP implementing organizations compared to non ERP implementing organizations. This indicates that auditors are utilizing the capabilities of ERP in auditing functions and that ERP is valuable to auditors. The other key finding of this research is that it is provided timely access, assessment and reporting of data and information in ERP environment. Finally, these functions of ERP systems enhance audit quality and auditors should have the technological skill and knowledge to attain efficient use of ERP functions in an audit engagement.

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