The Impact of Continuous Auditing Technology in ERP System on Improving the Internal Audit Performance: A Field Study

Mohamed Aly Wahdan *
Hatem A. Alshaarawy**
Alaa Allah Mostafa El-Serafy **

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*) Prof. Dr. Mohamed Aly Wahdan Professor of Auditing and Vice-Dean for Postgraduate studies and researches, Faculty of Commerce, Menoufia University , my research interests are auditing ,AIS, IT and tax Accounting.
Email: Wahdan@msn.nl

**) Dr. Hatem A. Alshaarawy Lecturer in Accounting Department, Faculty of Commerce, Menoufia University,Ph. D. In Accounting, faculty of economics, Goettingen University, Germany. Research interests are financial accounting, international accounting, and auditing.
Email : Sharawy1963@yahoo.com

***) Alaa Allah Mostafa El-Serafy ,Holds a Master Degree in Commercial Science, Faculty of Commerce, Menoufia University, my research interests are auditing
Email : Alaa_serafy@yahoo.com

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Abstract

The study objective is to investigate the impact of CA technology adoption in ERP system on improving the internal audit performance. To achieve this objective, the levels of changing from traditional auditing to CA in ERP system have been presented, whereas this new technology has the capability to improve the internal audit performance.

Moreover, the literature related to the study has been reviewed, and a field study has been conducted using the questionnaire list and interviews with internal auditors, managers, as well as IT staff (programmers and analysts of information systems) in the selected companies. The findings of the study indicated that (1) there is significant difference among the categories of the study on the impact of CA technology in ERP system on improving IA performance, (2) there is a significant relationship between adopting continuous auditing in ERP system and the internal audit performance, and (3) there is a significant impact of adopting continuous auditing technology on improving the internal audit performance.

الملخص

تهدف الدراسة إلى اختبار أثر استخدام تكنولوجيا CA في نظم ال ERP على تحسين أداء المراجعة الداخلية. ولتحقيق هذا الهدف تم تناول مستويات التطور من المراجعة التقليدية إلى المراجعة المستمرة في نظم ال ERP، في حين أن هذه التكنولوجيا الجديدة لديها القدرة على تحسين أداء المراجعة الداخلية.

كذلك تم مراجعة الدراسات السابقة المتعلقة بالدراسة، وإجراء دراسة ميدانية باستخدام قوائم الاستقصاء و المقابلات الشخصية مع عينة الدراسة و تشمل المراجعين الداخليين والمديرين، وكذلك موظفي تكنولوجيا المعلومات (من المبرمجين ومحللي نظم المعلومات) في الشركات محل الدراسة، وأشارت نتائج الدراسة إلى: (١). هناك اختلاف كبير بين فئات الدراسة حول تأثير تكنولوجيا CA في نظم ال ERP على تحسين أداء IA. (٢) توجد علاقة ذات دلالة احصائية بين تبني تكنولوجيا المراجعة المستمرة في نظم ال ERP وأداء المراجعة الداخلية. و (٣) هناك تأثير كبير لتقنية المراجعة المستمرة فى نظم ال ERP على تحسين أداء المراجعة الداخلية.

10

1. Introduction:

Auditors tend to use information technology (IT) in order to deal adequately with the complexity of the audit process and to serve their clients with more comfort. Therefore, internal auditors need to develop new methods and processes during auditing processes in order to enhance their IT knowledge and skills on internal control to fulfill their mission as required by their professional standards (Bedard et al., 2005).

Continuous Auditing (CA) technology is a comprehensive electronic audit process that enables auditing process more effective and efficient through use of IT helping auditors to provide some degree of assurance on continuous information simultaneously with, or shortly after, the disclosure of the information. There is a difference between CA in Enterprise Resources Planning (ERP) system and traditional audit (Wiegerinck, 2019).

CA technology is independent substantive activity, as the fact that the (Artificial Intelligent) IA work is not subject to any restrictions that substantially limit the scope and effectiveness of the examination and reporting of the results, enabling the IA team to focus on the most dangerous areas, helping management to meet the legal and legislative requirements, and supporting the ability to properly evaluate the internal control structure (El Seginy et al., 2010).

CA technology is a regular process because it includes a set of steps starting with defining objectives, identifying suitable programs for data analysis, gathering and analyzing appropriate data, and preparing CA reports whether there are exceptions or not (El Sayad, 2012). So, the main three research questions examined in this paper are: is there any significant difference among the categories of the study regarding the impact of CA in ERP system on improving IA performance? is there a significant relationship between CA technology in ERP system and IA performance? and is there a significant impact of CA technology in ERP system on improving IA performance?

CA technology adds value through means of improving compliance with laws, legislations, risk management and ability to achieve objectives, providing new levels of regulation to follow up internal control, introducing

11

The Impact of Continuous Auditing Technology in ERP System on Improving the Internal Audit Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

reliable and trusted information provided by internal auditors (Abu Jabal, 2015).

Applying CA technology in ERP system makes audit process more efficient and effective because of using automation (Chan & Vasarhelyi, 2011). Moreover, it leads to simplified and timely assurance of internal controls in ERP system that assesses in improving Internal audit (IA) performance to enhance their ability to predict and estimate the possible outcome of transactions and accounts in advance, so auditors can add value through detecting deviations from expectations of large amounts of data (Teeter, 2014; Andersson, 2017).

So applying CA technology in ERP system is to shift from the traditional audit method in samples to CA technology of all operations of the establishment, to ensure the effectiveness of internal control and information according to the regulations and legislation, to reduce fraud, tampering and errors, to use IT, to increase the efficiency of the audit process and to issue audit reports in a timely, trusted and reliable manner. It also helps in making future decisions.

2- Literature Review and Hypotheses Development

In this section, the related literature is reviewed and the hypotheses are developed.

The study of (Kuhn et al., 2010), aimed to explore the alternative architectures for CA that have been proposed in both the research and practice environments and identify the strengths and weaknesses of each architectural form as a basis for forming a research agenda that could allow authors to contribute to the future evolution of both ERP system designs and auditor implementation strategies. The findings of the study indicated that exploration has only just begun on understanding the behavioral effects on an organization's employees and managers, but these issues are also critical to anticipating the impact as these systems become more widespread. Opportunities abound for research facilitating the efficient and effective implementation and utilization of CA capabilities.

The study of (Sims, 2012) aimed to develop a census among a population of large corporations in several industries in the qualifications of their IA. The PCAOB does not specify what constitutes qualified or unqualified internal auditors. The findings of the study indicated that internal and IT auditors were familiar with the latest CA techniques. Because of using CA technology, internal auditors experience increased.

The study of (Vasarhelyi, 2012) aimed to study CA technology adoption, examine of how auditors actually perceive and use an emerging technology to provide guidance to both audit practitioners and researchers about how CA technology can evolve from a purely academic concept to meet the reality of business. The findings of the study indicated that to perform audit process and data analysis efficiently; IA needs a certain level of information system and data access either via application programs or via extractions by the IT department. The results showed that internal auditors have positive attitude toward the usefulness of CA and CM as it facilitates audit works, especially SOX compliance, it allows auditors to work more efficient, a certain amount of work can be automated & scope of work could be expanded.

The study of (Mshabet, 2014) aimed to study and analyze the continuous IA under electronic operating of data, analyze the relationship between CA and CM, and test the impact of continuous IA on achieving objectives of internal control. The findings of the study indicated that the adoption of CA by internal auditors have a positive impact on the economic units in terms of operational efficiency of operations, and compliance with legislation and regulations, and also have a positive impact on the IA's ability to achieve its objectives in terms of activating the CM of the internal control structure elements as well as achieving the financial and operational audit and compliance audit.

The study of (Wu et al., 2016) aimed to examine the influences of various competencies, team problem-solving ability, and computer audit activity on IA performance, and employs a survey and applies the partial least squares regression method. The findings of the study indicated that team problem-solving ability and computer audit activity positively influence IA performance, and that competencies indirectly influence IA performance

The Impact of Continuous Auditing Technology in
ERP System on Improving the Internal Audit
Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

through the mediating effects of team problem-solving ability and computer audit activity. Therefore, IA performance requires not only team cooperation and computer audit activity but also the competency of IA.

The study of (Amin et al., 2016) aimed to explore the perceptions of auditors in Egypt toward the role that CA can play in offsetting the challenges facing the quality of Internet-reported financial information. The paper also examines the impact of audit firm type and years of experience on these perceptions. The findings of the study indicated that the majority of auditors in Egypt agree that implementing CA can offset the challenges associated with the Internet financial reporting (IFR) environment; also there are significant differences between auditors working in Big 4 audit firms and those working in local firms regarding the perceptions of the effect of CA on the timeliness of information.

The study of (Weins et al., 2016), aimed to provide a new conceptual framework on how to bring CA to the next level, examine existing technical concepts and solutions for implementation by developing a more holistic Integrated CA Approach and illustrate how CA can be adopted in order to increase audit efficiency. The findings of the study indicated that IA can strengthen its position within the corporate governance structure and is in the best position to take over new responsibilities for the CA platform. Adjusting the roles of auditors will also change the responsibilities of external auditors. The achievable higher audit efficiency can add significant value to all stakeholders.

The study of (Andersson, 2017) aimed to investigate which factors that motivate an adoption of CA amongst various internal audit functions (IAFs), explored answers to why the adoption is so modest, and made interviews with internal auditors at large Nordic companies the study set out to capture the factors leading to an intention to use CA or not. The findings of the study indicated that CA represents value-adding methodologies for IAF as there are several ways to increase the efficiency and effectiveness in the IAF, one of which is CA. Thus, if CA should be realized by IAFs, some of the internal auditors' perceptions of CA have to be altered. This could be done through an increased cooperation amongst academia, standard-setting groups, and internal auditors in setting a common way forward.

14

The objectives study of (Tarek et al., 2017) are to explore the impact of implementing IT on the auditing profession in a developing country, namely, Egypt, examine auditors' perception on the extent of use and perceived importance of using technology in auditing in the different economic and cultural setting of Egypt. The findings of the study indicated that auditors' perception regarding client's IT complexity is significantly affected by the use of IT specialists and the IT expertise of the auditors. Besides, they perceive that the new audit applications' importance and the extent of their usage are significantly affected by the IT expertise of the auditors.

The study of (Tsai et al., 2017) aimed to examine the factors determining the performance of IA in the context of internal auditors' work environments. This includes Enterprise Risk Management (ERM) implementation, ERP system, the use of auditing software and the internal auditors' IT competence. Results confirmed that the complete ERM implementation and effectiveness of ERP have significant impacts on the performance of IA. It also highlights the importance of internal auditors' IT competence in improving IA performance.

The study of (Neamah & Hasan, 2019) aimed to demonstrate the role of CA in activating the reliability of the ERP system. The findings of the study indicated that the application of CA techniques in enterprises that implement the ERP system helps to create an environment that allows efficient and efficient control of the enterprise. In addition, the use of CA techniques helps to create a competitive advantage for enterprises that implement the ERP system by providing appropriate, reliable and timely information that helps the decision maker to reach the right decisions at the lowest cost and as quickly as possible.

The study of (Wiegerinck, 2019) aimed to provide an overview of the concept of CA and to provide an overview of how the implementation of CA can be facilitated. The findings of the study indicated that CA considers an audit approach performed by the IA to conduct effective integrated auditing and monitoring by utilizing technology to continuously gather data from the operational processes, also timing of audits is to report events continuous providing 100 coverage.

15

The study of (Al Frijat, 2020) aimed to highlight the importance of compliance with continuing professional development (CPD) of internal auditors and its relationship to the quality of internal audit. The findings of the study indicated that there is a positive results regarding the importance of CPD in improving the quality of the internal audit, focused on the continuous follow-up to changes related to income and sales tax law, that CPD represents in professional skills is the development of skills to detect and combat theft and fraud, critical thinking skills of analyzed data.

Previous studies explained that

Studies had also found that deficiencies in the Egyptian Auditing Standards (EAS) and weaknesses in training of auditors as applying the new technology needs a lot of qualifications and training and there is a lack of training centers.

Studies had reached the importance of using new technologies; some studies had also concluded the importance of applying CA technology in improving IA performance.

The current study suggests a framework for applying CA technology in ERP system to IA performance. To the best of our knowledge, the study is an integral in ERP system part of the previous research group, rather than repeating it.

The previous studies did not deal with the impact of CA technology in ERP system on improving IA performance. So this is what the present study seeks through testing the hypotheses of the study to ascertain the extent of the impact of CA technology in ERP system on IA performance in the Egyptian establishments.

Therefore the hypotheses can be developed as follows:

- There is significant difference among the categories of the study on the impact of CA technology in ERP system on improving IA performance.
- There is a significant relationship between adopting CA technology in ERP system and the IA performance.
- There is a significant impact of adopting CA technology on improving IA performance.

16

3- CA Technology & IIA
3-1. CA in ERP system

Changes of technology push the IA to move from traditional form being an automated mechanism compliance with organization's policies and procedures; to enhance a more preventive proactive role with a strong focus on risk management and continuous business performance improvement (Majdalawieh & Zaghloul, 2009; El Bardan, 2014).

ERP system has allowed CA technology as information systems to be used in maintain real-time sharing and monitoring of information (Kuhn & Sutton, 2010). Enterprise can maximize the transparency of financial information, enhance operational efficiency, and improve business processes by implementing the CA system for timely monitoring of information (Shin et al., 2013). Moreover, ERP system is used to integrate all corporate information into one central database so they allow information to be retrieved from many different organizational functions and objectives (Gullkvist, 2013).

According to (Wiegerinck, 2019, p.15) defined CA technology as:

"Continuous auditing is a concept to bring the audit process closer to the operational process by utilizing technology to the maximum possible degree of audit automation. Which enables auditors to provide continuous assurance on specific subject and to reduce costs."

3-2. Purposes of CA technology: (El Sayad, 2012; Vasarhelyi et al., 2012; Mshabet, 2014).

1. The inadequacy of the traditional audit of financial statements in detecting fraud and error in business reports
2. Ensure the effectiveness and efficiency of internal control according to the regulations and legislation.
3. Determining the efficiency and effectiveness of immediate accounting systems in maintaining the objectivity of the data and producing trusted and reliable information.
4. Improving IA performance and IA reports.

3-3. Conditions for applying CA technology: (El Sayad, 2012)

1. Internal controls should be reliable and trusted.
2. Accessibility of information freely without restrictions.

17

The Impact of Continuous Auditing Technology in
ERP System on Improving the Internal Audit
Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

3. Availability of the professional and technical competence of the auditor in the use of IT and auditing operations.
4. Availability of accuracy features in the auditor reports in a timely manner.

3-4. Methodology of CA technology in ERP System:

Many studies have taken into account the advantages of applying CA technology in ERP system (Shin et al., 2013; Razaei, 2013; Kanellou & Spathis, 2011, 2013) as follows:

- CA technology in ERP system adds value to business reports published electronically as a result of timely submission of the audit report, timely disclosure and fraud of financial information, ensuring that information is safe, accurate, and reliable in decision-making.
- CA technology in ERP system gives confidence and credibility to business reports as a result of issuing customized reports suitable for internal and external use.
- Inclusiveness, flexibility and continuity of internal control.

Based on the study of (Sun et al., 2015) IA applying CA technology provides a systematic approach to evaluate and improve the effectiveness of the overall internal control environment for protecting the electronic business from fraud, manipulation and unauthorized penetration, resulting in the production of accurate, reliable, and meaningful information for decision-makers (Rezaee et al., 2001 & Razea et al., 2002).

3-5. IIA

According to (IIA) defined IA as: (IIA, 2016, p.5).

> "Internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes"

Internal auditors need to possess IT skills to understand IT environments, in order to ensure the internal controls, and to ensure that new systems and modifications to existing systems are adequately performed to enable them

18

to complete their audit work (Warren, 2004; Abu-Musa, 2008; Tarek et al., 2017).

To perform audit task effectively, auditors must recognize the key reasons to use audit tools and software, which will be further explored as follows: (Moorthy et al., 2011)

- Ability to gain new skills
- Increase the efficiency of an audit.
- Reduce routine tasks to provide more time for creative and business analysis.
- Provide improved transparency governance of the organization.
- Identify quantitative root causes for issues.
- Reduce fraud and abuse.

3-6. Impact of CA in ERP system on IIA

Conditions must be presented by the IA to apply CA technology in ERP system, (Wahdan et al., 2005b) indicated knowledge based systems in auditing would be helpful in training auditors, standardizing the procedures and report, and filling part of the lack observed in expertise and experience and in the application of auditing standards, so there are several needs for improving IA performance:

- Audit team must be trained and experienced to better use technology and rely less on manual procedures.
- Better IT skills and understanding of system controls
- Better analytical tools and training to spot and detect risks.

CA technology can improve auditors' performance by reducing time and errors due to automated auditing process. CA technology is more cost effectively enabling auditors to test larger samples (100%) and examine data faster and more efficiently compared to their manual predecessors. CA technology allows auditors to actively detect and investigate exceptions as they occur rather than to react after exceptions have long occurred. CA technology can be considered as pro-active and enables corrective action to be taken as soon as a problem is detected increasing continuous assurance; CA technology can improve IA performance, and increases confidence and credibility in reports (Rezaee et al., 2001; price water coopers, 2006; IIA 2009a; Lins et al., 2016; Barr-Pulliam, 2017).

19

The Impact of Continuous Auditing Technology in
ERP System on Improving the Internal Audit
Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

4- Research methodology:

Methodology of field study includes a description of the companies under study applied to the ERP system in Egypt, society, sample and the data collection methods.

Data collection:

In order to achieve the objectives of the study, the authors relied on the following sources:

1 - Preliminary sources: The questionnaire list as a basic tool for data collection has gone through three major stages to the final:

2- Secondary sources: A number of personal interviews were conducted with a group of specialists in the field of designing and programming information systems, as well as with a group of managers and experts in the auditing of accounting information systems, as well as internal auditors in the companies under study.

Population and sample:

The authors distributed the questionnaire form to the companies under study. The study sample consisted of (48) internal auditors, (36) managers, (24) of the information systems employees in the companies under study, where the response rate as shown in table (4/1):

Table (1): Distribution of sample study according to the response

Statement	Number of lists submitted	Number of lists received	Number of valid lists for analysis	Response rate
Internal Auditors	75	52	48	64%
Managers	45	41	36	80%
IT Staff	30	26	24	80%
Total	150	119	108	72%

(Source: authors' calculation)

20

Analysis of the demographic variables of the society and sample of the study:-

- Distribution of the community and sample of the study according to the scientific qualification:-

Table (2): Distribution of the study sample according to the scientific qualification

Qualification	Frequency	Percent
PhD	4	3.7
MSc	16	14.8
Diploma	15	13.9
BSc	73	67.6
Total	108	100.0

(Source: authors' calculation)

The table (2) shows the high level of education as (32.4%) of the respondents have a high level of education (postgraduate diploma, MSc, PhD)

- Distribution of the study sample according to experience in the field of auditing:-

Table (3): Distribution of the community and sample of the study according to experience in the field of auditing:-

experience in audit	Frequency	Percent
>10	30	27.8
Between 5-10	48	44.4
<5	30	27.8
Total	108	100.0

(Source: authors' calculation)

The table (3) shows the high level of experience in the field of auditing, as (72.2%) of the respondents who exceed their level of experience for 5 years.

- Distribution of the study sample according to experience in ERP system:-

21

The Impact of Continuous Auditing Technology in
ERP System on Improving the Internal Audit
Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

Table (4): Distribution of the community and sample of the study according to experience in ERP system:-

experience in ERP	Frequency	Percent
>10	16	14.8
Between 5-10	37	34.3
<5	55	50.9
Total	108	100.0

(Source: authors' calculation)

The table (4) shows the high level of experience in ERP, as (49.1%) of the respondents who exceed their level of experience for 5 years.

- Distribution of the study sample according to training course:-

Table (5): Distribution of the community and sample of the study according to training course:-

Training course	Frequency	Percent
Continuous	65	60.2
Don't have	5	4.6
Other	38	35.2
Total	108	100.0

(Source: authors' calculation)

The table (5) shows the high level of training courses, as (60.2%) of the respondents who have continuous courses.

Through the previous presentation it is possible to emphasize the possibility of relying on the results obtained because they are based on a high balance of experience and education.

22

The study variables:

Independent variable (X) is the CA technology in ERP system including variables from X1 to X7 totaling 48 factors.

Dependent Variable (Y) is IA performance including variables from Y1 to Y4 totaling 30 factors.

Statistical techniques

Multiple statistics techniques have been used in the study as follows: Descriptive analysis, Cronbach's Alpha, One-Sample Kolmogorov Smirnov Test, T-test, correlation, and regression analysis.

5- Discussion and results

To measure the reliability and validity tests. Coefficient alpha is the most popular coefficient reported to support the reliability of a scale. Coefficient alpha is easy to interpret and refers to the degree coefficient alpha approaches 1.0; a scale demonstrates greater internal consistency. Table (6) highlights the coefficient of reliability and validity for each variable.

Table (6) shows that the value of the reliability coefficient at the survey level in general is (92.7%), which is statistically good. The reliability coefficient values for all the questions and axes of the survey list are (63.6%- 79.5%- 56.1%- 75.8%- 64.5%- 67%- 88.3%- 79.5%- 78.2%- 80.9%- 84.2) also statistically good. The reliability coefficient is 60%.

The table above also shows that the value of validity coefficient at the survey level in general is (96.2%), which is statistically good. The validity coefficient values for all the questions and axes of the survey list are (79.7%- 89.1%- 74.8%- 87%- 80.3%- 81.8%- 93.9%- 89.1%- 88.4%- 89.9%- 91.7%) also statistically good. The validity coefficient is 60%.

Therefore, we arrive at the survey list, which has a high degree of internal reliability and consistency, and can be relied upon to achieve the objectives of the study and to disseminate the results.

23

The Impact of Continuous Auditing Technology in
ERP System on Improving the Internal Audit
Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

Table (6): The validity and reliability of the survey list of the main variables

The survey list axes	Variable	Number of Phrases	Reliability coefficient	Validity coefficient
Motivation to apply CA in ERP system	X1	8	63.6%	79.7%
Conditions and requirements for applying CA in ERP system	X2	7	79.5%	89.1%
The purpose of adopting CA in ERP system	X3	6	56.1%	74.8%
Characteristics of CA in ERP system	X4	8	75.8%	87%
Methodology for applying CA in ERP system	X5	6	64.5%	80.3%
Advantages of adopting CA technology in ERP system	X6	6	67%	81.8%
Problems and Challenges to Adopt CA Technology in ERP system	X7	7	88.3%	93.9%
IA performance characteristics	Y1	5	79.5%	89.1%
The conditions that must be met by the internal auditor to apply CA technology in ERP system	Y2	7	78.2%	88.4%
Competence or professional care of the IA	Y3	7	80.9%	89.9%
The features of the CA technology in ERP system on IA performance	Y4	11	84.2%	91.7%
Total		78	92.7%	96.2%

(Source: authors' calculation)

Hypothesis testing

The first hypothesis: "There is no significant difference among the categories of the study on the impact of CA technology in ERP system on improving IA performance"

To verify the validity of this hypothesis, the significance of the differences between the mean between the different study categories (internal auditors, managers, and Information Technology-IT staff) was tested by using Kruskal Wallis Test (One of the unscientific tests used to measure the extent of agreement or difference in the opinions of different sample groups in each of the statement of the study, after excluding the non-significant statements), This is test whether there are differences between the views of the study categories on internal audit performance (Y) and CA technology in ERP environment (X), as shown in tables (7) and (8).

Table (7) Kruskal Wallace test results related to IA performance

	Chi-Square	P-Value	Significance
Y1: IA performance characteristics	9.178	.010	Significant
Y2: The conditions that must be met by the IA to apply CA technology in ERP system	5.353	.069	Significant
Y3: Competence or professional care of the internal auditor	8.822	.012	Significant
Y4: The features of the CA technology in ERP system on IA performance	6.948	.031	Significant

(Source: authors' calculation)

Table (7) shows that there is a statistically significant difference about IA performance (Y) from the point of view of different study sample categories of job at 5% significance level for the variables IA performance characteristics, the conditions that must be met by the IA to apply CA technology in ERP system, competence or professional care of the internal auditor, and the features of the CA technology in ERP system on IA performance. In the same context, there is a statistically significant difference

The Impact of Continuous Auditing Technology in ERP System on Improving the Internal Audit Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

At a significant level (5%) represented in (Y1: IA performance characteristics; Y3: Competence or professional care of the internal auditor; Y4: The features of the CA technology in ERP system on IA performance). Moreover, there is a statistically significant difference about IA performance (Y) from the point of view of different study sample categories, and at a significant level (10%) represented in (Y2: The conditions that must be met by the IA to apply CA technology in ERP system).

In addition, table (8) illustrates the results of Kruskal Wallace test related to CA technology in ERP system.

Table (8) reveals that there is a statistically significant difference about CA technology in ERP system (X) from the point of view of different study sample categories of job at 5% significance level for the variables motivation to apply CA technology in ERP system, In the same context, there is a statistically significant difference about CA technology in ERP system (X) at 10% significance level for the variables IA to apply CA technology in ERP system.

Table (8) Kruskal Wallace test results related to CA technology in ERP system

	Chi-Square	P-Value	Significance
X1: Motivation to apply CA technology in ERP system	11.403	.003	Significant
X2: Conditions and requirements for applying CA technology in ERP system	7.805	.020	Significant
X3: The purpose of adopting CA technology in ERP system	5.212	.074	Significant
X4: Characteristics of CA technology in ERP system	15.546	.000	Significant
X5: Methodology for applying CA technology in ERP system	3.172	.205	Insignificant
X6: Advantages of adopting CA technology in ERP system	6.536	.038	Significant
X7: Problems and Challenges to Adopt CA Technology in ERP System	6.355	.042	Significant

(Source: authors' calculation)

At a significant level (5%) represented in (X1: Motivation to apply CA technology in ERP system; X2: Conditions and requirements for applying CA technology in ERP system; X4: Characteristics of CA technology in ERP system; X6: Advantages of adopting CA technology in ERP system; X7: Problems and Challenges to Adopt CA Technology in ERP System).

There is statistically significant differences about CA technology in ERP system (X) from the point of view of different study sample categories, and at a significant level (10%) represented in (X3: The purpose of adopting CA technology in ERP system).

There is not statistically significant differences about CA technology in ERP system (X) from the point of view of different study sample categories represented in (X5: Methodology for applying CA technology in ERP system).

The results indicated that the first hypothesis "There is no significant difference between the categories of the study on the impact of CA technology in ERP system on improving IA performance" can be rejected, and accept alternative hypothesis that there is significant difference among the categories of the study on the impact of CA technology in ERP system on improving IA performance.

The second hypothesis: There is no significant relationship between adopting CA technology in ERP system and the IA performance. To verify the validity of this hypothesis, the spearman coefficient was used for correlation analysis showed in table (9).

Table (9): Matrix Correlation Coefficients between Key Variables

	Y1	Y2	Y3	Y4
X1	.053	.172	.176	.280**
X2	.473**	.562**	.450**	.350**
X3	.401**	.394**	.480**	.516**
X4	.163	.238*	.322**	.451**
X5	.426**	.405**	.531**	.412**
X6	.181	.287**	.313**	.399**
X7	.175	-.061	-.017	-.039

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
(Source: authors' calculation)

27

The Impact of Continuous Auditing Technology in ERP System on Improving the Internal Audit Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

Table (9) shows that there is a strong positive correlation between IA performance (Y) and CA technology in ERP system (X).

As a result of matrix correlation there is a positive response between coefficients independent variable (X) CA technology in ERP system and dependent variable (Y) IA performance, in accordance to:

The Pearson correlation coefficient with two stars (**) represent strong correlation significance at the 0.01 level – such as:

- (X1 motivation to apply CA technology in ERP system) with (Y4 the features of the CA technology in ERP system on IA performance) is (.280**), that represents a strong positive correlation.

The Pearson correlation coefficient with one star (*) represent significance correlation at the 0.05 level – such as:

- (X4 characteristics of CA technology in ERP system) with (Y2The conditions that must be met by the IA to apply CA technology in ERP system) is (.238*), that represents a positive correlation.

The results show that there is a strong positive correlation between IA performance (Y) and CA technology in ERP system (X), according to Spearman's correlation coefficient, and at a significant level (.01).

It is noted from previous correlation results that the second hypothesis "There is no significant relationship between adopting CA in ERP system and the IA performance" can be rejected, and accept alternative hypothesis.

The third hypothesis: "There is no significant impact of adopting CA technology on improving IA performance".

Previous results of Kruskal Wallace test indicated the purpose of identifying the most important predictive variables of the adoption of CA technology in the ERP system that contribute to improve the IA performance, so the authors used the backward step regression analysis, in order to find a predictive model through determining the amount of coefficient of multiple correlations and the relative contribution of the

28

impact of independent variables on dependent variables. This method depends on the selection of variables that do not have a self-correlation.

Table (10) The results of regression related to the important variables affecting the Y1: IA performance characteristics

	Variable	Unstandardized Coefficients		Stand-ardized Coefficients	T	P-value	VIF	Tol
		B	Std. Error					
X1	Motivation to apply CA technology in ERP system	-.205	.108	-.187	-1.895	.061	1.586	.631
X2	Conditions and requirements for applying CA technology in ERP system	.296	.107	.255	2.757	.007	1.392	.718
X3	The purpose of adopting CA technology in ERP system	.394	.129	.343	3.041	.003	2.064	.484
X4	Characteristics of CA technology in ERP system	-.085	.121	-.073	-.707	.481	1.724	.580
X5	Methodology for applying CA technology in ERP system	.338	.119	.263	2.840	.005	1.397	.716
X7	Problems and Challenges to Adopt CA Technology in ERP System	.113	.056	.169	2.037	.044	1.120	.893
Constant		.704						
Correlation coefficient	R	.615						
Determination coefficient	R^2	.378						
Adjusted determination coefficient	$Adj.R^2$	.341						
F- test		10.244						
P-value		0.000						

(Source: Authors' calculation)

29

Table (10) shows the results of the Backward Step Regression analysis to determine the most important predictive variables affecting the dependent variable (Y) IA performance; Table (10) shows the significance of the model used as a whole in the influence relationship test of independent variables of (X) on dependent variable (Y1) IA performance characteristics that include independency, honesty, responsibility, skills, competency, and experiences of IA.

$$Y_1 = 0.704 - \mathbf{0.205X_1} + \mathbf{0.296X_2} + \mathbf{0.394X_3} - 0.085X_4 + \mathbf{0.338X_5} + \mathbf{.113X_7}$$

In the previous equation, the significant impacting variables are written with bold, confirming the accuracy of the model the variability of the influential variables. Moreover, the variance inflation factor (VIF) for each variable is less than (10) and the tolerance is greater than (0.1) for each variable, meaning that there is no multilinearity among the explanatory variables so we can rely on the results of this model. From the previous table (10), the significance of the model used as a whole in testing the influence of the explanatory variables on the dependent variable, (Y) at 5% significance level.

The significance of whole model can be tested by using F- test (10.244). To take decision, the p-value for F- test can be used; it tends to zero (0.000), as it is less than the significance level 5% which means that the model is valid for predicting the value of the dependent variable (Y1) IA performance characteristics. Moreover, the there is a high correlation (.615) between independent variables and dependent variable. Furthermore, the determination coefficient reveals that the explanatory variables are contributing to explain 38% of the variation in the dependent variable. Concerning the significance of each explanatory variable, the t-test can be used. The results show that the variables (the purpose of adopting CA technology in ERP system, Characteristics of CA technology in ERP system and Advantages of adopting CA technology in ERP system) have a significant influence on the dependent variable (IA performance characteristics) at 5% significance level. The results show also that the variable (conditions and requirements for applying CA technology in ERP system) has significant influence on the IA performance characteristics at 10 % significance level. Whether, the variable of characteristics of CA technology in ERP system has insignificant influence on (Y1) IA performance characteristics.

30

Table (11) shows the results of the backward step regression analysis to determine the most important predictive variables affecting the dependent variable (Y) IA performance.

Table (11) The results of regression analysis to determine related to the important variables affecting the Y2: The conditions that must be met by the IA to apply CA technology in ERP system

	Variable	Unstandardized Coefficients		Stand-ardized Coeffici-ents	T	P-value	VIF	Tol
		B	Std. Error					
X2	Conditions and requirements for applying CA technology in ERP system	.459	.094	.448	4.867	.000	1.376	.727
X3	The purpose of adopting CA technology in ERP system	.157	.102	.154	1.535	.128	1.648	.607
X4	Characteristics of CA technology in ERP system	-.077	.104	-.074	-.743	.459	1.636	.611
X5	Methodology for applying CA technology in ERP system	.206	.105	.182	1.966	.052	1.391	.719
X7	Problems and Challenges to Adopt CA Technology in ERP System	-.050	.049	-.084	-1.015	.313	1.120	.893
Constant		1.296						
Correlation coefficient	R	.611						
Determination coefficient	R^2	.373						
Adjusted determination coefficient	$Adj.R^2$	.343						
F- test		12.158						
P-value		0.000						

(Source: authors' calculation)

The Impact of Continuous Auditing Technology in ERP System on Improving the Internal Audit Performance: A Field Study

**Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy**

Table (11) shows the results of the backward Step regression analysis to determine the most important independent variables (X) affecting the dependent variable (Y2) the conditions that must be met by the IA to apply CA technology in ERP system, including the responsibility of managers to apply CA technology and ensure CM and also showed how internal auditors aware of entity's objectives, strategies, risks, the ability they can deal with according to skills of CAATs they have.

$$Y_2 = 1.296 + \mathbf{0.459X_2} + \mathbf{0.157X_3} - 0.077X_4 + \mathbf{0.206X_5} - .050X_7$$

In the previous equation, the significant impacting variables are written with bold, confirming the accuracy of the model the variability of the influential variables. Moreover, the VIF for each variable is less than (10) and the tolerance is greater than (0.1) for each variable, meaning that there is no multilinearity among the explanatory variables so we can rely on the results of this model. From the previous table (11), the significance of the model used as a whole in testing the influence of the explanatory variables on the dependent variable, (Y) at 5% significance level. The significance of whole model can be tested by using F- test (12.158). To take decision, the p-value for F- test can be used; it tends to zero (0.000), as it is less than the significance level 5% which means that the model is valid for predicting the value of the dependent variable (Y2) the conditions that must be met by the IA to apply CA technology in ERP system. Furthermore, the determination coefficient reveals that the explanatory variables are contributing to explain 37% of the variation in the dependent variable. Moreover, the there is a high correlation (.611) between independent variables and dependent variable. Concerning the significance of each explanatory variable, the t-test can be used. The results show that the variable (conditions and requirements for applying CA technology in ERP system) has a significant influence on the dependent variable (The conditions that must be met by the IA to apply CA technology in ERP system) at 5% significance level. The results show also that the variable (Methodology for applying CA technology in ERP system) has significant influence on the IA performance characteristics at 10 % significance level. Whether, the variables of the purpose of adopting CA technology in ERP system, characteristics of CA technology in ERP system and problems and challenges to Adopt CA technology in ERP System have

insignificant influence on (Y2) the conditions that must be met by the IA to apply CA technology in ERP system.

Table (12) The results of regression analysis related to the important variables affecting the Y3: Competence or professional care of the internal auditor

	Variable	Unstandardized Coefficients		Standardized Coeff-icients	T	P-value	VIF	Tol
		B	Std. Error					
X1	Motivation to apply CA technology in ERP system	-.110	.096	-.107	1.255	.212	1.50	.667
X2	Conditions and requirements for applying CA technology in ERP system	.204	.097	.187	-1.144	.255	1.36	.736
X3	The purpose of adopting CA technology in ERP system	.341	.114	.316	2.101	.038	1.92	.521
X5	Methodology for applying CA technology in ERP system	.418	.105	.346	2.987	.004	1.31	.765
Constant				.704				.2...
Correlation coefficient	R			.615				
Determination coefficient	R^2			.378				
Adjusted determination coefficient	Adj.R^2			.341				
F- test				17.205				
P-value				0.000				

(Source: authors' calculation)

33

The Impact of Continuous Auditing Technology in ERP System on Improving the Internal Audit Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

Table (12) shows the results of the backward step regression analysis to determine the most important independent variables (X) affecting the dependent variable (Y3: competence or professional care of the internal auditor) that identifies the ability, plans and skills of internal auditors to ensure security of information with CM to perform adequate reports in a timely manner, and examining the results of the table notes that the analysis of the progressive regression has selected the most important independent variables according to the order of importance in the construction of the predictive model, namely:

$$Y_3 = .704 - .110X_1 + 0.204X_2 + \mathbf{0.341X_3} + \mathbf{0.418X_5}$$

In the previous equation, the significant impacting variables are written with bold, confirming the accuracy of the model the variability of the influential variables. Moreover, the VIF for each variable is less than (10) and the tolerance is greater than (0.1) for each variable, meaning that there is no multilinearity among the explanatory variables so we can rely on the results of this model. From the previous table (12), the significance of the model used as a whole in testing the influence of the explanatory variables on the dependent variable, (Y) at 5% significance level. The significance of whole model can be tested by using F- test (17.205). To take decision, the p-value for F- test can be used; it tends to zero (0.000), as it is less than the significance level 5% which means that the model is valid for predicting the value of the dependent variable (Y3) competence or professional care of the internal auditor. Furthermore, the determination coefficient reveals that the explanatory variables are contributing to explain 38% of the variation in the dependent variable. Moreover, the there is a high correlation (.615) between independent variables and dependent variable. Concerning the significance of each explanatory variable, the t-test can be used. The results show that the variables (The purpose of adopting CA technology in ERP system, and methodology for applying CA technology in ERP system) have a significant influence on the dependent variable (competence or professional care of the internal auditor) at 5% significance level. The results show also that the variable (Motivation to apply CA technology in ERP system, and conditions and requirements for applying CA technology in ERP system) have

34

insignificant influence on (Y3) competence or professional care of the internal auditor.

Table (13) shows the results of the backward step regression analysis to determine the most important independent variables (X) affecting the dependent variable (Y4: The features of the CA technology in ERP system on IA performance) resulted in increasing knowledge, technology skills, and experiences of internal auditors, also can minimize time, cost, and needed efforts. They focus on detecting risks timely, increasing trust and reliance of IA reports to be able to rely on results of CA technology in ERP system to improve IA performance, and examining the results of the table notes that the analysis of the progressive regression has selected the most important independent variables according to the order of importance in the construction of the predictive model:

$$Y_4 = .023 + \mathbf{0.390X_3} + 0.186X_4 + \mathbf{0.263X_5} + .163X_6$$

In the previous equation, the significant impacting variables are written with bold, confirming the accuracy of the model the variability of the influential variables. Moreover, the variance inflation factor (VIF) for each variable is less than (10) and the tolerance is greater than (0.1) for each variable, meaning that there is no multilinearity among the explanatory variables so we can rely on the results of this model. From the previous table (13), the significance of the model used as a whole in testing the influence of the explanatory variables on the dependent variable, (Y) at 5% significance level. The significance of whole model can be tested by using F- test (13.821). To take decision, the p-value for F- test can be used; it tends to zero (0.000), as it is less than the significance level 5% which means that the model is valid for predicting the value of the dependent variable (Y4) the features of the CA technology in ERP system on IA performance. Further, the determination coefficient reveals that the explanatory variables are contributing to explain 35% of the variation in the dependent variable. Moreover, the there is a high correlation (.59) between independent variables and dependent variable. Concerning the significance of each explanatory variable, the t-test can be used.

The Impact of Continuous Auditing Technology in ERP System on Improving the Internal Audit Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

Table (13) The results of regression analysis related to the important variables affecting the Y4: The features of the CA technology in ERP system on IA performance

	Variable	Unstandardized Coefficients		Stand-ardized Coeff-icients	T	P-value	VIF	Tol
		B	Std. Error					
X3	The purpose of adopting CA technology in ERP system	.390	.128	.305	3.062	.003	1.567	.638
X4	Characteristics of CA technology in ERP system	.186	.135	.143	1.376	.172	1.702	.587
X5	Methodology for applying CA technology in ERP system	.263	.130	.184	2.029	.045	1.299	.770
X6	Advantages of adopting CA technology in ERP system	.163	.119	.131	1.366	.175	1.447	.691
Constant		.023						
Correlation coefficient	R	.591						
Determination coefficient	R^2	.349						
Adjusted determination coefficient	$Adj.R^2$	.324						
F- test		13.821						
P-value		0.000						

(Source: authors' calculation)

The results show that the variables (The purpose of adopting CA technology in ERP system, and methodology for applying CA technology in ERP system) have a significant influence on the dependent variable (The features of the CA technology in ERP system on IA performance) at 5% significance level. The results show also that the variable (Characteristics of CA technology in ERP system and Advantages of adopting CA technology in
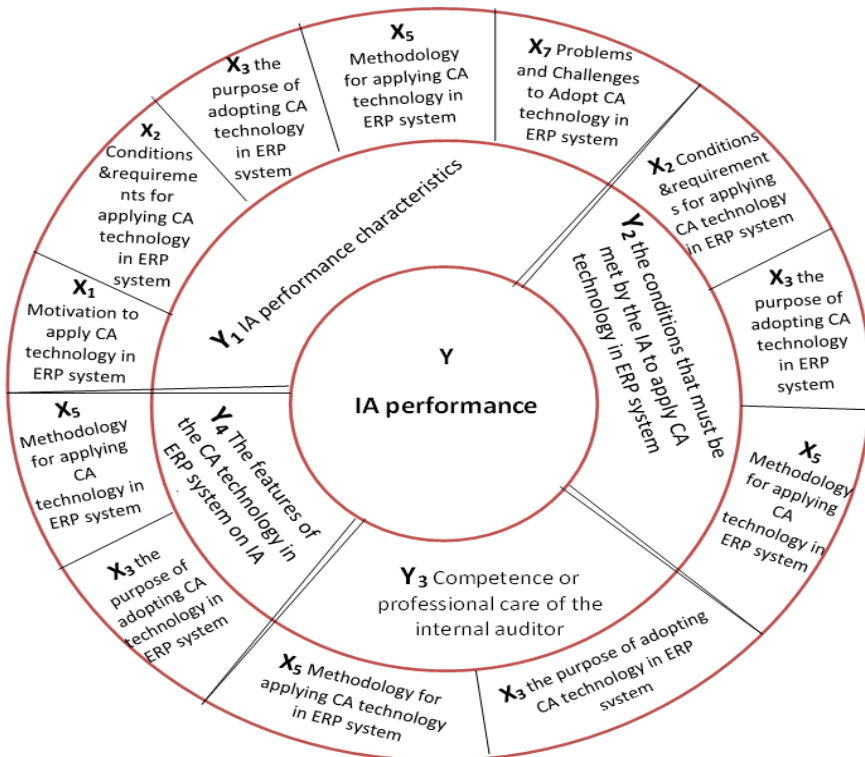
36

ERP system) has insignificant influence on (Y4) the features of the CA technology in ERP system on IA performance.

The results of the regression analysis showed in figure (1).

Figure (1) indicated that the IA performance (Y) affected by CA technology in ERP system (X) as:

- IA performance characteristics (Y1) affected by motivation to apply CA technology in ERP system (X1), conditions and requirements for applying CA in ERP system (X2), the purpose of adopting CA technology in ERP system (X3), and methodology for applying CA in ERP system (X5).

Figure (1): Summary of regression analysis.

(Source: authors)

The Impact of Continuous Auditing Technology in
ERP System on Improving the Internal Audit
Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

- The conditions that must be met by the IA to apply CA technology in ERP system (Y2) affected by conditions and requirements for applying CA in ERP system (X2), the purpose of adopting CA technology in ERP system (X3) methodology for applying CA in ERP system (X5).
- Competence or professional care of the internal auditor (Y3) affected by the purpose of adopting CA technology in ERP system (X3), and methodology for applying CA in ERP system (X5).
- The features of the CA technology in ERP system on IA performance (Y4) affected by the purpose of adopting CA technology in ERP system (X3), and methodology for applying CA in ERP system (X5).

It also indicated that the characteristics of CA in ERP system (X4) and advantages of adopting CA technology in ERP system (X6) have no impact on IA performance (Y).

It is noted from previous backward step regression analyses results that the third hypothesis "There is no significant impact of adopting CA technology on improving IA performance" can be rejected and accept alternative hypothesis that there is a significant impact of adopting CA technology on improving IA performance.

6-Conclusion, Limitations and Future Research

6-1. Conclusion:

This study presents the impact of adopting CA technology in ERP system and its impact on improving IA performance. The main three research questions examined in this paper are: is there any significant difference among the categories of the study regarding the impact of CA in ERP system on improving IA performance? is there a significant relationship between CA technology in ERP system and IA performance? And is there a significant impact of CA technology in ERP system on improving IA performance? To answer the research questions, data was collected from a survey of various companies using ERP system in Egypt. The findings of the study indicated that IA performance can add value to the ERP system by improving the effectiveness of systems by assessing the risks associated with them, advising on the construction of controls to achieve security and safety, and achieving the company's goal of implementing a reliable system

38

to improve its operations. Finally it is clear that the main reason for the tendency of the auditors to use the CA approach is to improving performance through move towards the mechanism in the processes due to the technological progress and try to narrow the gap of expectations regarding the internal auditors and the responsibility of the administration to design and implement an effective structure of internal control and compliance with laws and regulations. Moreover, the findings of the study indicated that (1) there is significant difference among the categories of the study on the impact of CA technology in ERP system on improving IA performance, (2) there is a significant relationship between adopting continuous auditing in ERP system and the internal audit performance, and (3) there is a significant impact of adopting continuous auditing technology on improving the internal audit performance.

6-2. Contribution and Implications

The paper makes a number of timely contributions to the extant literature and has policy implications for future various enterprises in Egypt. First, it complements and extends the literature to the impact of CA technology in ERP System on improving IA performance. Second, it is the first study to provide empirical evidence about the impact of CA technology in ERP System on improving IA performance in developing countries (in particular in Egypt). Third, applying the continuous auditing technology in ERP system to improve IA performance is a new trend. It becomes an essential requirement after acceleration of new technologies, so enterprises need very high quality to move on as most of developed countries and few of developing countries have already applied CA technology in ERP system to raise their IA performance to reach the desire of success and that can be useful for the Egyptian companies to use as a guide in the way of implementation, taking into consideration the factors that can be changed. Finally, the contribution to the investment will be reflected on the infrastructure of the company and the information technology systems used which are playing an essential role for improving IA performance to cope with the new management systems that will be definitely reflected to the company performance in terms of efficiency and effectiveness.

The Impact of Continuous Auditing Technology in
ERP System on Improving the Internal Audit
Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

6-3. Recommendations:

Companies need to apply CA technology in ERP system due to the integration of these systems to the activities and functions, and linking them with their customers and suppliers. This is to obtain updated and timely information. So it needs to re-engineer its operations to achieve objectives, competitive advantages, and also to improve their operations and IA performance. There is a need to assess the technological capabilities and strategic planning skills of the IA personnel, developing them through training and workshops to enable them to enhance their technological skills.

A positive coordination among members of the IA should be formed by the directors of the department of IA in the case of the application of a new system or the development of existing systems, so they can effectively play their role during their application, generate a positive sense of their suitability, and benefit from them advisory and assurance function in all levels. This is adds real value to their company.

The need for a professional institute, or a specialized scientific society to be interested in the development of continuously IA performance, through the development of scientific and practical conditions for the practice of the profession, translating professional publications issued by the Institute of Internal auditors.

6-4. Limitations and uture studies

There is a limitation to generalize the study results due to we depend only on companies applied ERP system from Egypt, and we ignore other companies working under the same conditions and possibilities with different systems. Future research should deal with: first, the impact of using extensive business reporting language (XBRL) on improving the effectiveness of CA technology in ERP system. Second, measure the quality of using CA technology in ERP system on the accuracy of risk prediction. Third, study the impact of using CA technology in ERP system on the quality of audit reports.

40

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41

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The Impact of Continuous Auditing Technology in ERP System on Improving the Internal Audit Performance: A Field Study

Mohamed Aly Wahdan
Hatem A. Alshaarawy
Alaa Allah Mostafa El-Serafy

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44