



# E-business internal audit: the elephant is still in the room!

E-business  
internal audit

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## Abstract

**Purpose** – The purpose of this paper is to explore the impact of technological change on the internal audit practices and skills requirements for internal auditors in an e-business environment.

**Design/methodology/approach** – Generalist internal auditors and specialist information technology (IT) internal auditors were surveyed online in ten countries, including the USA and the UK which, together, provided the majority of responses.

**Findings** – The results suggest a need for advanced IT-audit techniques in conducting the internal audit function, thereby increasing IT audit skill demands on generalist internal auditors. However, the results show a low confidence among internal auditors about their IT training and a continuing reliance upon IT audit specialists, rather than their own training/retraining.

**Research limitations/implications** – The responses obtained in this study provide insight into both the status quo of the internal audit function, and to the changes that are needed to prepare generalist internal auditors for work in an e-business environment and, while the scale of the study limits the extent to which the findings may be generalized, they are consistent with the literature concerning the changing business environment and with the literature on resistance to change, suggesting that the issues revealed should be of concern.

**Practical implications** – The results reported in this paper are useful to internal auditing educators and regulators in their consideration of the skills needed by generalist internal auditors in e-business environment.

**Originality/value** – This study sheds light on a significantly growing area which remains relatively unexplored in the auditing-related literature, e-business audit. The study provides empirical evidence on challenges facing internal auditors in an e-business environment, thereby serving as a wake-up call, to both internal auditors and the professional bodies representing them, to defend their jurisdictional space against rival professional groups.

**Keywords** E-commerce, E-business, Internal audit, IT audit, Resistance to change

**Paper type** Research paper

## 1. Introduction

The exponential growth over the past 15-20 years in the implementation of e-business has introduced unprecedented changes to the traditional business environment. These changes have created new dimensions for business communications and relationships,

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requiring a complex of IT infrastructures and use of a public network (the internet) that is outside the direct control of individual entities. If not effectively protected and monitored, these internal IT infrastructures that are exposed to the internet may expose a business's data and business information systems to unknown outsiders (Pathak, 2004). One result of these exposures is that the nature and severity of traditional business risks change and new business risks are created, many of which are IT based (International Federation of Accountants (IFAC), 2002). These new risks impact the entity's risk profile (The Institute of Internal Auditors (IIA), 2003) requiring greater adoption of innovative IT-based controls and security measures such as firewalls and digital authentication (Canadian Institute of Chartered Accountants (CICA), 2003).

Most conventional audit techniques and practices are based upon "visibility of assets and business processes" and assume that "control of the people and processes remain within the enterprise" (IIA, 2003, p. 11), something that ceases to apply in an e-business environment. As a result, a conventional approach (e.g. auditing around or through the computer) to internal audit is either no longer applicable or is less capable of providing sufficient assurance over both risks and controls at the required speed (Ballington and Tortorice, 2000; IIA, 2003). As Bartolucci and Chambers (2007) state, the nature and complexity of e-business require internal auditors to adopt real-time IT-driven audit techniques (e.g. continuous auditing, continuous monitoring, and continuous assurance) to perform review tasks, risk assessment, and detailed testing of controls on a continuous and comprehensive basis. This represents a significantly different form of activity requiring skills and technical abilities not traditionally assumed to be part of the skill set of an internal auditor (Stoel *et al.*, 2012; Vasarhelyi *et al.*, 2012).

Thus, the highly technology-supported nature of e-business requires internal auditors to develop and maintain specialist IT audit expertise (Bagranoff and Vandrzyk, 2000; Pathak and Lind, 2010). Consequently, the implementation of e-business creates a knowledge gap between what these internal auditors require to know about the process they are reviewing and their limited understanding of the IT-based systems that support that process (Chaney and Kim, 2007; Steinbart *et al.*, 2012).

To overcome this knowledge gap, many internal audit departments have delegated/outsourced IT audit tasks to IT audit specialists within/outside the organization (Bartolucci and Chambers, 2007). While this addresses the need for appropriately skilled internal audit teams responsible for monitoring e-business processes, it may result in another gap – a communication gap – between the internal auditors who are not specialists in e-business audit and those who are (Brazel, 2008; Steinbart *et al.*, 2012). Further, it may threaten the ongoing professional status/role of internal auditors who are not specialists in e-business auditing (Kotb *et al.*, 2012).

While many research studies have investigated the impact of information technology (IT) on auditing practice and the profession (see, e.g. Sutton and Hampton, 2003; Weidenmier and Ramamoorti, 2006; Janvrin *et al.*, 2008; Abu-Musa, 2008; Curtis *et al.*, 2009; Abdolmohammadi and Boss, 2010), there is a lack of empirical studies addressing the impact of e-business on the internal audit function from the perspective of internal auditors. In particular, most previous e-business audit studies have examined the impact of e-business on external audit practice and the profession and not upon internal auditing and auditors (ACL, 2001; Auditing Practices Board, 2002; IFAC, 2002; Kotb, 2008; Pathak and Lind, 2010; Kotb and Roberts, 2011; Kotb *et al.*, 2012).

Other internal and external auditing studies have also failed to address this issue, instead being concerned with providing an overview of e-business-driven audit changes from a very technical perspective (Liang *et al.*, 2001; Santo and Tribolet, 2004; Shaikh, 2005) or developing a theory without providing empirical data (Rezaee and Reinstein, 1998; Yu *et al.*, 2000; Pathak, 2003, 2004; IIA, 2003; Zhao *et al.*, 2004). Overall, relatively little attention has been paid to the implications of such technological changes for the professional role and expertise of internal auditors.

In a changing environment, resistance to reskilling and learning new techniques is likely (Coch and French, 1948; Byrnes *et al.*, 2012). When this is combined with a lack of awareness of the major implications these e-business led changes have for generalist (i.e. traditional) internal auditors, it is likely that many will fail to adjust effectively to working in such an environment. Inevitably, this will lead to deprofessionalization as they lose their positions to IT-specialist internal auditors and to increasing difficulty in their securing new assignments and in advancing their careers.

Using online questionnaire data, this study aims to explore the impact of technological change on the internal audit practices and skills requirements for internal auditors in an e-business environment, thereby contributing to the extant literature in different ways. First, it addresses a gap in a significantly growing area, e-business audit, which remains relatively unexplored in the auditing-related literature. Second, it provides empirical evidence which supports and adds to the theoretical literature (Ballington and Tortorice, 2000; Bartolucci and Chambers, 2007; Chaney and Kim, 2007; Shaikh, 2005; Weidenmier and Ramamoorti, 2006; Yu *et al.*, 2000; Zhao *et al.*, 2004) on how technological developments (i.e. e-business) could change the audit practices and skills requirements for internal auditors when engaged in a techno-centric environment. Third, this study extends the work of Kotb and Roberts (2011) and Kotb *et al.* (2012) on the internal audit context. Fourth, It extends the accounting professionalization literature by going beyond the traditional expansionist view of the accounting/auditing profession (e.g. Covaleski *et al.*, 2003; Pong, 1999; Walker, 2004) and exploring a specific situation in which traditional accounting/auditing professionals are likely to lose their status to another competing professional group, specialist IT auditors. Finally, this study serves as a wake-up call to internal auditors and the profession as a whole to defend their hard-earned jurisdictional authority to operate as auditors in an e-business environment.

The next section provides a review of the impact of e-business on internal audit and presents the study's research questions. The methodology and results are presented in the following sections. The final section summarizes and discusses the implications of the findings, the limitations of the study and suggests future directions for this line of research.

## 2. Background

The emergence of e-businesses has resulted in two main changes in traditional business organizations. It has changed, not only the way organizations carry out their day-to-day businesses but, also, the nature of work done, the nature of business relationships, and how an enterprise structures itself to get its business carried out (Gale and Abraham, 2005). This transformation in structuring and implementing business mainly depends upon the internet and complex web technologies (Pathak, 2004), which has introduced a number of significantly different business risks such as business availability, loss of confidentiality, unauthorized transactions and fraud, concentration of control, reliance on third parties, potential legal liability, and potential

loss of audit trails (IIA, 2003; Weidenmier and Ramamoorti, 2006). The enhanced level of these new risks has altered the entity's risk profile (IIA, 2003) and increased the importance of system reliability and security (CICA, 2003).

In turn, the nature of e-business and associated risks alters and even weakens most traditional internal controls, thereby driving demand for new types of IT-based controls and security measures to mitigate these new e-business risks (IIA, 2003; Kotb and Roberts, 2011). These new controls and security measures must be automatic, dynamic, integrated, preventive, multi-compensating, real-time, corrective, monitoring, and include sound authentication procedures. Examples of these IT-based controls include: firewalls, encryption, intrusion detection systems, digital signatures and public key infrastructure, and anti-virus programmes (Lightle and Vallario, 2003; Alles *et al.*, 2004; Weidenmier and Ramamoorti, 2006).

Consequently, the emergence of e-business has changed traditional business organizations and placed different needs and concerns both upon the manner in which internal audit procedures are performed and in how they are performed. While internal auditors have audited "around" and "through" the computer in traditional computerized business environments (Matthews, 2006), internal audits of e-business need to eliminate the superficiality of traditional computer auditing and require changes to be made throughout the process, from planning audit activities to reporting on the auditor's work (Rezaee and Reinstein, 1998; Liang *et al.*, 2001; IIA, 2003; Pathak, 2003; Zhao *et al.*, 2004; Shaikh, 2005; Pathak and Lind, 2010; Kotb and Roberts, 2011; Stoel *et al.*, 2012).

In contrast with a traditional audit, internal auditors in an e-business do not just audit control activities, they also monitor the entity's risk profile and play a key role in identifying areas to improve risk management processes. The IIA (2003) provide some guidance, suggesting that while the most significant risks of e-business are usually outside the direct control of the enterprise, the internal audit procedures should be based on four key concepts: confidentiality, integrity, availability, and non-repudiation in order to identify the risks associated with each of these concepts and to ascertain the controls and security measures required.

E-business therefore requires internal auditors to move beyond traditional static and cyclical internal audit methodologies and adopt new more advanced real-time IT-based audit techniques and practices (e.g. continuous auditing)[1] that match the nature and level of e-business risks and controls (Weidenmier and Ramamoorti, 2006). This view is supported by KPMG's, 2009 IT Internal Audit Survey which found that internal audit departments need to use IT-based audit tools widely to support the entire audit process from planning through to reporting.

Effective internal auditing reduces business risk. In an e-business environment, this has the potential to reach new levels. For example, Pathak (2004) emphasizes the benefit of integrating internal audit into e-business systems (p. 562): "the audit review process will provide the closed-loop cycle of continuous improvements that is imperative in today's [e-business] world". The means of doing so is available: continuous auditing may be used to perform control and risk assessment automatically and on a real-time basis, thereby permitting testing of 100 per cent of transactions and allowing timely notifications of gaps and weaknesses and immediate follow-up and remediation (Vasarhelyi *et al.*, 2012). Thus, internal auditors are able to perform control and risk assessments in real time, providing real time assurance and enhancing the reliability of real time financial information (Hinson, 2007; Chan and Vasarhelyi, 2011).

While prior research has advocated the need for IT-based controls during e-business audits, the literature provides little empirical evidence on the potential impact of e-business on internal audit practice. To address this situation, the views of interested groups, such as generalist internal auditors and IT audit specialists, on how e-business might influence and/or change internal audit practice was viewed as one source that could be pursued. The perspectives of internal auditors are clearly important in this respect and assessing their perspectives, in turn, can help determine whether they are conducting e-business audits in an appropriate way. Accordingly, the first research question to be investigated is:

*RQ1.* How do internal auditors perceive the impact of e-business on internal audit practice?

The second research question concerns the impact e-business has had upon the expertise required of internal auditors and upon their role. It is acknowledged that the traditional perception of the internal audit function has moved from that of corporate watchdog to that of a more proactive function with a strong focus on risk assessment and management, and continuous performance improvement (IIA, 2004a; Menk, 2007). In response, the role of the internal auditor has evolved towards being more consultative (Menk, 2007) to include, for example: facilitating identification and evaluation of risks; providing assurance on risk management processes; giving assurance that risks are correctly evaluated; safeguarding of assets; and, compliance (Weidenmier and Ramamoorti, 2006). It is doubtful whether this form of assurance can be provided without a thorough understanding of the organization's IT infrastructure, systems, processes, risks, and constituents; recording and evaluating controls over critical/sensitive information; and assessing monitoring procedures (Parker, 2001).

According to Sections 302 and 404 of the Sarbanes Oxley Act, since IT control weaknesses can result in significant compliance vulnerabilities and can affect accounting functions possibly resulting in a risk of material misstatement, IT auditing has become an integral and obligatory aspect of the internal audit function (Richards *et al.*, 2005; Singleton, 2010a, 2010b). Furthermore, the recent revised versions of COSO internal control integrated framework (Committee of Sponsoring Organization of the Treadway Commission, 2012) and COBIT 5 framework for the governance and management of enterprise IT (Control Objectives for Information and related Technology, 2012) adds further emphasis to this, stating that reliance on technology in conducting business introduces new risks most of which are IT based, thereby making risk identification, analysis, and mitigation more difficult, resulting in dramatic changes in the control landscape. Such professional guidelines implicitly reinforce the importance of specialized IT expertise for internal auditors (Chaney and Kim, 2007), leading to ask Zhao *et al.*'s (2004, p. 399) question: "who will be the ideal job candidate" for the internal audit function in an e-business environment?

It is, therefore, unsurprising that the Institute of Internal Auditors (IIA) requires its members to have sufficient knowledge of how IT is and should be used in business processes, as well as knowledge of key IT risks, associated controls, and IT-based audit techniques (Implementation Standard, 1210.A3, IIA, 2004b), and that it has done so for some time. However, such recommendations can only be truly effective if those for whom they are intended are willing to consider their adoption. Unfortunately, Chaney and Kim (2007) found that this does not seem to be the case: many internal auditors

believe that any IT issue is the exclusive domain of the IT auditors: “[w]ords such as ‘program’, ‘system’ and ‘application’, combined with ‘control’, typically leave auditors thinking: ‘That’s not my job. Leave that for the IT auditor to test’” (p. 47).

KPMG (2009) confirmed that IT audit is being siloed: “[...] IT audit is an essential component of overall audit activity. All too often, however, audit departments operate in ‘silos’ where IT audit is undertaken in isolation from other audit activity and, indeed, other IT assurance activity” (p. 7). For e-business generalist internal auditors, such ignorance may be bliss but, for their profession, IT is the “elephant in the room”[2] (Chaney and Kim, 2007), and it is increasing in size as their knowledge gap increases in line with increases in the sophistication of technology in the systems they monitor. PWC (2010) found that this lack of IT skills of generalist internal auditors is perceived as the greatest barrier in leveraging an organization’s significant systems (e.g. ERP) with CAATs when performing internal audit activities.

Thus, rather than reskilling generalist internal auditors, internal audit departments have focused upon delegating/outsourcing IT audit tasks to IT audit specialists within/ outside the organization (Steinbart *et al.*, 2012). In 2000, it was estimated that the number of IT auditors employed by the then Big Five (now Big Four) accounting firms would have grown from a base of 100 in 1990 to 5,000 in 2005 (Bagranoff and Vendrzyk, 2000). While this addresses the need for internal audit teams responsible for monitoring e-business processes, Chaney and Kim (2007) not surprisingly argue that this silo-focused approach to IT audit activities can lead to inadequate scoping and execution of audits.

The importance of appropriately skilled auditors was further highlighted by Brazel (2008) who found that both the competence of an IT auditor and the AIS expertise of the auditor affect the quality of the audit. He also found that both auditor AIS expertise and IT auditor competence affect how these two professions interact on an audit engagement, referring to a potential communication gap that might result when the AIS expertise of auditors is low (Steinbart *et al.*, 2012). From a technical point of view, the delegation of IT audit tasks (which represents a significant percentage of the e-business audit process) could impose a threat to the quality of the internal audit function and may result in internal auditors reaching a point when they are unable to determine whether the internal audit process is operating effectively.

From a professional point of view, the delegation of the total burden of IT audit in an e-business environment might open the door to IT audit specialists (those who are not professionally qualified auditors) to take over much of the internal auditor’s role in leading and conducting the internal audit process (Kotb *et al.*, 2012). Hence, not only do generalist internal auditors working in an e-business environment face a reduction in demand for their services at the hands of specialist IT auditors, they are also liable to be replaced by IT specialists from other professions. It is difficult to see any other long-term future for non-IT-skilled generalist internal auditors in e-business companies if they fail to accept that their future may depend upon their reskilling to become specialist IT auditors.

As mentioned previously, little attention has been paid to the impact of increasing use of IT-based systems in organizations on the professional role and expertise of auditors, as most studies in this area were concerned with the desirable IT skill set and role of external, rather than internal auditors. Given this gap in the literature, the second research question to investigate in this study is:

*RQ2.* How do internal auditors perceive their expertise and role might be impacted by e-business-driven changes in internal audit practice?

### 3. Research method

In order to answer the two research questions, data were gathered by means of an online questionnaire. It consisted of 22 open, semi-closed, and closed questions, covering how e-business might change the internal audit practice; and, how any such e-business-driven changes might impact the expertise and role of internal auditors. Demographic data were also collected and respondents were invited to add their personal comments which they felt might be of benefit to the study. A pilot version was prepared and tested with two accounting academics and three audit practitioners, each of whom was asked to evaluate the instrument for clarity and quality of instructions and of the questions; time to complete; the general flow of topics in the questionnaire; and, the appropriateness of the questions in relation to the research objectives. Following the feedback received, minor revisions were made and the final questionnaire was produced.

In order to maximize exposure of the questionnaire, it was distributed electronically to generalist internal auditors and specialist IT internal auditors through an embedded link in an e-mail sent to the UK Higher Education Internal Audit Service providers; the Scottish Local Authorities Chief Internal Auditors Group; the UK & Ireland Information Systems Audit and Control Association (ISACA) chapters; and, various IDEA & ACL user groups in the UK. Outside the UK, a link to the survey was posted on various internal audit groups on [www.linkedin.com](http://www.linkedin.com) and [www.yahoo.com](http://www.yahoo.com), as well as various IT auditor groups on [www.itaudit.co.uk](http://www.itaudit.co.uk) and [www.isaca.org](http://www.isaca.org). In addition, a link to the survey was included in the IIA monthly e-newsletters in both January and March 2011 and e-mailed to some local chapters of the IIA in the USA. Participation in the study was encouraged by describing the purpose of the survey to participants (Lazar and Preece, 1999) and by entering them into a draw for two cash prizes of \$100 each (Frick *et al.*, 2001; O'Neil *et al.*, 2003). As the response rate is unknown, following Davis and Tuttle (2010), we report the completion rate. A total of 162 individuals accessed the questionnaire, 79 of whom reached the end of the questionnaire and submitted their answers, a completion rate of 49 per cent.

Totally, 57 per cent of the respondents were generalist internal auditors, 18 per cent were specialist IT internal auditors and 25 per cent worked in both roles. In order to aid comparison between those with IT experience and those without, the latter two groups, which together comprised 43 per cent of the respondents, were combined in the subsequent analysis. For ease of reference, this composite group is referred to as the "specialist IT internal auditors" throughout the rest of this paper. On average, the generalist internal auditors had 12 years experience compared with seven years for the specialist IT internal auditors. Totally, 91 per cent of respondents had undergraduate degrees, 40 per cent of which were in accounting. Totally, 8 per cent had postgraduate accounting degrees and 29 per cent had an MBA. Totally, 73 per cent were members of the IIA, and 36 per cent were members of the ISACA. Respondents worked in 13 different industries and were located in ten different countries; with the majority in the USA and the UK. All the respondents worked in business environments with differing degrees of e-business integration ranging from enterprises that used the web only to build awareness amongst stakeholders, to enterprises using an integrated web-based supply chain linking together customers and suppliers with back-office processing and information systems. The majority (60 per cent) worked for organizations that either integrate internet-processed activities with back-office information systems or interact with different stakeholders through an integrated web-based supply chain[3].

#### 4. Results

##### 4.1 *The impact of e-business on internal audit procedures and processes*

In order to explore the impact of e-business on internal audit practice, respondents were asked to answer an open-ended question which asked how e-business affects the internal audit plan. As shown in Table I, the respondents indicated that e-business increases the salience of IT issues during the audit planning phase, increases the audit universe, and can result in greater use of IT audit specialists.

While these results are not surprising and are consistent with the literature (Mahzan and Lymer, 2008; Kim *et al.*, 2009; Abdolmohammadi and Boss, 2010), the relatively low level of impact indicated upon the use of CAATs is surprising. In a situation where many internal auditors are not IT specialists, the opposite response would have been expected. Recent studies (Mahzan and Lymer, 2008; Kim *et al.*, 2009; Abdolmohammadi and Boss, 2010) which found limited use of CAATs suggest that this is due to a combination of a lack of IT-trained internal auditors, the non-mandatory adoption of these tools by internal auditors, and a lack of software applications available which meet the perceived needs of internal auditors. The latter is very much dependent on the ability of internal auditors to identify those needs and to determine whether the available software is capable of meeting them, a difficult task given their limited level of expertise and training in this area. However, these responses may suggest that even those who have the necessary IT skills are not viewing CAATs as a solution to the increase in reliance on IT in an e-business environment at the planning stage of an internal audit.

Respondents consistently indicated that operating in an e-business environment was one more issue that needed to be considered when preparing the internal audit plan. Of course, recognizing the need to adjust the internal audit plan is not the same as actually using people who are sufficiently skilled to carry out the plan. This is echoed in their comments to this question providing insight into how e-business may impact the audit plan:

The internal audit plan should be modified to take into consideration the following: The risks related to IT specially if the IT is a significant component of the business strategy, the controls have IT components, the testing methods and using of CAAT's (Computerized audit automated techniques).

It doesn't. Just increases the audit universe.

There is an increased reliance on IT specialist auditors for planning and testing of automated controls. In addition, the testing of SDLC's is essential to the integrity of the audit.

	Generalist internal auditors ( <i>n</i> = 31)		Specialist IT internal auditor ( <i>n</i> = 22)		Overall (53)	
	No.	%	No.	%	No.	%
More emphasis on IT issues	22	70.97	15	68.18	37	69.81
Increases audit universe	12	38.71	4	18.18	16	30.19
Greater use of IT audit specialists	7	22.58	4	18.18	11	20.75
No effect	1	7.28	5	22.73	6	11.32
Greater use of CAATs	3	6.98	1	4.55	4	7.69

**Notes:**  $\chi^2$  comparing the two groups:  $p = 0.15592$

**Table I.**  
Impact of e-business on the internal audit plan: generalist IAs vs specialist IT IAs



It doesn't change the plan significantly, but it does entail a heavier reliance on ITGCs [Information Technology General Controls] and more use of specialists.

It doesn't really. It is another area that needs to be considered as part of a risk-based plan. It just may be that IT auditors may be involved in more of the IA plan if the organization uses more IT throughout the organization.

Overall, these comments suggest that these internal auditors adjust the audit plan for relevant IT issues, thereby increasing the relevance of IT audit expertise and increasing the audit universe.

While increased use of CAATs was not generally foreseen at the planning stage, results suggest that CAATs become more important when performing procedures during the internal audit. The responses of participants to an open-ended question relating to their perceptions of how e-business affects internal audit procedures are shown in Table II:

Comments concerning use of CAATs included:

The using of CAATs will be increased. The SAMPLE needed will be changed. The timing of the procedures will be changed.

Again it doesn't except that it may shift the percentage of IT auditing vs operational/financial auditing for a specific audit. Also depends on the e-business application.

Makes the preparation of audit procedures more useful and effective and increase the efficiency.

Principles remain same but approach revised to reflect type of work to be undertaken.

Greater use of CAATs, and more testing of ITGCs.

Thus, while the need for greater use of CAATs in situations where many internal auditors are not IT specialists may not be recognized at the planning stage, it is recognized when the internal audit is being conducted. This may be due to it being acknowledged that the internal audit team lacks sufficient expertise to undertake the

	Generalist internal auditors (29)		Specialist IT internal auditor (19)		Overall (48)	
	No.	%	No.	%	No.	%
Audit procedures more focused on IT audit issues	10	34.48	6	31.58	16	33.33
No significant change	6	20.69	5	26.32	11	22.92
Increases use of CAATs	6	20.69	4	21.05	10	20.83
Increases number of audit procedures	4	13.79	3	15.79	7	14.58
Increases relevance of IT audit expertise	3	10.34	3	15.79	6	12.50
Greater use of IT audit specialists	2	6.90	2	10.53	4	8.33
Increases efficiency of audit process	4	13.79	0	0.00	4	8.33
Greater reliance on third party vendors	2	6.90	1	5.26	3	6.25
Greater auditing through the system	3	10.34	0	0.00	3	6.25
Changes sampling techniques	2	6.90	1	5.26	3	6.25
Changes timing of audit procedures	1	3.45	0	0.00	1	2.08

Notes:  $\chi^2$  comparing the two groups:  $p = 0.81921$

**Table II.**  
Impact of e-business on internal audit procedures: generalist IAs vs specialist IT IAs

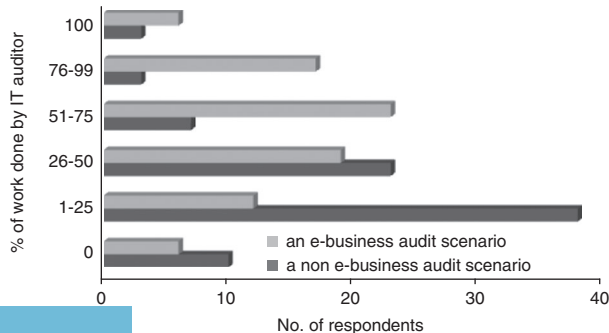
audit using other means and/or it may arise as a result of adoption of CAATs being identified during the audit that were not perceived at the planning stage.

Despite the increased use of IT in e-business information systems, only one-third of respondents believed that conducting an internal audit in an e-business environment led to a greater focus on IT audit issues than on traditional internal audit issues. This unexpected response appears to suggest that the fact that an internal audit was being conducted of highly computerized transactions was not a sufficiently important variable to be worthy of special attention. This echoes the responses reported above concerning the internal audit plan: conducting an internal audit in an e-business environment is assumed by some to simply extend what is to be done; they do not believe that it fundamentally changes the nature of the internal audit. In addition, as shown in Table II, few respondents believed that either e-business results in a greater reliance upon third party vendors or that the internal audit of e-business is more efficient than an internal audit conducted in a traditional environment. Consistent with this finding, more than a decade has elapsed since the use of third part vendor products for continuous monitoring and continuous auditing began to achieve prominence in the USA, with two annual conferences (WCARS: <http://raw.rutgers.edu/23wcars>) being organized in the USA, South America, and Europe at which vendors, accountants, and academics meet to debate the current state of this technology and what it will be capable of in the near future. Despite the presence of high-profile vendors, such as ACL, and debate and scholarly publications, this lack of penetration to those actually working as internal auditors should give cause for concern and serves to add more weight to the view that there is an IT elephant “in the internal audit room”.

Figure 1 shows the extent to which respondents reported that specialist IT auditors are being used in e-business compared with non-e-business internal audits. These results are consistent with Abdolmohammadi and Boss (2010) and reflect increased involvement of IT audit specialists in internal audit tasks of more complex IT-based organizations.

Figure 1 also indicates that IT specialists are involved in routine audit work though they do a far lower proportion of that work, with virtually the opposite being the case on an e-business audit. As shown in Table III, this was confirmed in the responses to an open-ended question asking respondents to indicate in which phases of the e-business internal audit process IT audit specialists participate.

Such a low proportion being involved in planning of the internal audit may, to some extent, explain why what was considered at the planning stage was not mirrored in practice. Looking at the overall profile of the roles of these respondents as shown



**Figure 1.**  
Internal audit work  
completed by IT audit  
specialists

in Table III presents a view of how the role of the internal audit profession may develop, particularly in the e-business audit environment: a profession of “integrated auditors” (Chaney and Kim, 2007), who do everything, rather than, as reflected in the profiles of the respondents, a profession comprising of two distinct types of internal auditor – generalists and IT specialists – some of whom are in both groups.

Overall, these findings suggest that adoption of an e-business model does not currently appear to have much impact on the planning of internal audit procedures, though it does add to the volume of planned activity and, consequently, does require internal auditors to consider specific IT issues. Thus, internal auditors are responding to the shift in emphasis towards e-business, not so much by redefining expertise-related resource requirements at the planning stage but by doing so more on the internal audit itself. The increased need for IT expertise clearly increases the need for “integrated” internal auditors who are equipped to work in either environment.

With respect to the importance of IT issues, the findings suggest that the technology-centric nature of e-business increases the salience of IT issues within the internal audit procedures, suggesting that internal auditors need to develop and maintain a specialized set of IT expertise beyond that typically found in non-e-business internal audits or risk being replaced by IT-specialist internal auditors capable of also conducting the rest of the internal audit. This issue is explored further in the next section.

#### 4.2 *The impact of e-business on internal auditor expertise and role*

To explore the implications of e-business-driven technological changes on the expertise and role of the internal auditor, respondents were asked a number of questions relating to the importance of and the need for IT expertise in an e-business audit environment. The responses to these questions indicated that participants believe that e-business increases the relevance and importance of IT audit expertise. However, while 80 per cent (52 per cent of whom were generalist internal auditors and 48 per cent specialist IT auditors) believed that internal auditors should be more knowledgeable and skilled in IT auditing issues when operating in an e-business environment, 20 per cent did not [4]. This appears a surprisingly high level of negative responses which clearly denies the extent to which IT is embedded in e-business business processes. Chaney and Kim’s (2007) IT elephant may pose a major threat for some of these internal auditors who appear to be failing to notice the obvious.

Perhaps this can be explained in part by internal auditors believing that they were safe and that these changes should be addressed by changing recruitment rather than

	Generalist internal auditors (31)		Specialist IT internal auditor (26)		Overall (57)	
	No.	%	No.	%	No.	%
All	18	58.06	18	69.23	36	63.16
Fieldwork/testing	10	32.26	9	34.61	19	33.33
Planning	6	19.35	2	7.69	8	14.04
Other (corporate IT issues)	4	12.90	2	7.69	6	10.53
None	3	9.68	1	3.85	4	7.02
Reporting	2	6.45	3	11.54	5	8.77
Risk assessment	2	6.451	0	0.00	2	3.51

Notes:  $\chi^2$  comparing the two groups:  $p = 0.57712$

**Table III.**  
IT audit specialists participation in the internal audit process of e-business: generalist IAs vs specialist IT IAs

reskilling, a view reflected in the responses shown in Table IV. Strongly reinforcing this perception, when asked to comment upon an open-ended question relating to what impact operating in an e-business environment had upon the expertise required by internal auditors, “very little” appears to have been the consensus view. Respondents indicated that, while being qualified as a certified internal auditor (CIA) is sufficient (but not ideal) for most internal audit tasks, there is an increasing need for IT-specialist internal auditors (or integrated internal auditors) for other tasks, a finding that was also confirmed by Abdolmohammadi and Boss (2010) and Stoel *et al.* (2012).

The responses in Table IV suggest that the perceived response to an increase in the proportion of IT audit specialists required is being met, not by the reskilling of existing internal auditors but by a greater emphasis on IT expertise when recruiting. Overall, this implies that career opportunities for IT-specialist auditors will be enhanced to the detriment of those generalist internal auditors who chose not to extend their expertise, something that was also reported by 55 per cent of respondents in the KPMG’s, 2009 IT internal audit survey.

Re-emphasizing Chaney and Kim’s (2007) call for integrated internal auditors and in line with Abdolmohammadi and Boss (2010), when asked how these IT-specialist internal auditors would differ from generalist internal auditors, 63 percent of respondents indicated that the need for IT audit training and IT audit qualifications increases in an e-business environment, and that the most appropriate qualifications to pursue in the acquisition of expertise of this type were the Certified Information Systems Auditor (CISA) qualification followed by the CIA. As shown in Table V, the two groups of internal auditors were in broad agreement concerning the appropriateness of these qualifications, with over three-quarters of respondents

**Table IV.**  
Impact of e-business on IT auditor career opportunities

	n	Strongly disagree				Strongly agree	Mean	$\chi^2$ p value
		1	2	3	4	5		
Greater emphasis is placed upon IT expertise when recruiting	76	0	5	24	34	13	3.72	0.20301
Specialist IT auditors have a wider range of roles in the audit profession	75	1	10	20	28	16	3.64	0.38647
The ratio of specialist IT auditors to internal auditors increases	76	5	9	24	26	12	3.41	0.05653

**Table V.**  
Impact of e-business on professional qualifications for internal auditors: generalist IAs vs specialist IT IAs

	Generalist internal auditors (22)		Specialist IT internal auditors (18)		Overall (40)	
	No.	%	No.	%	No.	%
Certified Information Systems Auditor (CISA)	16	72.73	15	83.33	31	77.50
Certified Internal Auditor (CIA)	6	27.27	4	22.22	10	25.00
Certified Information Systems Security Professional (CISSP)	2	9.09	5	27.78	7	17.50
Certified Information Security Manager (CISM)	2	9.09	3	16.67	5	12.50
Certified Fraud Examiner (CFE)	1	4.55	2	11.11	3	7.50
Information Technology Architect Certification (ITAC)	1	4.55	1	5.56	2	5.00
Others	4	18.18	2	11.11	6	15.00

**Notes:**  $\chi^2$  comparing the two groups:  $p = 0.81907$

recommending the CISA qualification. However, as shown in Appendix, only 34 per cent of the respondents hold this qualification.

Further highlighting the gap between what respondents perceived to be appropriate for internal auditors in an e-business environment and what currently exists, they also identified a shortage of such expertise among internal auditors. While some believed that the appropriate skills are held by their internal audit colleagues, as shown in Table VI, the proportion of respondents who actually believed this to be case was relatively low with only 38 per cent (57 per cent of whom were generalist internal auditors and 43 per cent specialist IT internal auditors) believing that non-specialist IT internal auditors had the necessary level of expertise. However, even those already working as specialist IT internal auditors were not consistently viewed as having sufficient IT-related skills – only 53 per cent of respondents (equally split between the two groups) believed that specialist IT internal auditors had the necessary expertise. Thus there may still be some way to go before even the specialist IT internal auditors are perceived to have the necessary IT expertise to carry out an effective and efficient internal audit within an e-business environment.

Only half the respondents had received training in auditing in an e-business context, many from more than one source. Most of them had received it in-house (60 per cent), from vendors (53 per cent), and when undergoing continuing professional development (40 per cent). Only a few mentioned other sources, such as professional associations like ISACA and the IIA, and college training courses. In addition, the opinions of the respondents were split and many were unsure whether or not they had received adequate or sufficient training to undertake an audit in an e-business setting. While 41 per cent of those who had had training believed it was sufficient, 13 per cent did not, and 46 per cent were undecided.

Overall, while there was a general consensus among the respondents that an e-business environment increases the importance of IT knowledge and skills for internal auditors, respondents were less confident about their own training and IT expertise and of the IT expertise of their colleagues. They saw the solution as recruitment of specialist IT internal auditors rather than in their own re-education. Given the efforts over the years by the IIA and the attention drawn to the need for internal auditors to be trained in this specialist area by the largest accounting firms, this is particularly worrying at a time when business has moved and is moving relentlessly towards greater and greater use of IT in its business processes[5].

## 5. Discussion and conclusion

This study used data from a sample of generalist internal auditors and specialist IT auditors in ten different countries to provide empirical evidence on the changing

	n	Strongly disagree				Strongly agree	Mean	$\chi^2$ p value
		1	2	3	4	5		
Internal auditors in your company possess the necessary IT expertise to conduct e-business audit	74	7	17	22	19	9	3.081	0.05639
Specialist IT internal auditors in your company possess the necessary IT expertise to conduct e-business audit	73	9	9	16	19	20	3.439	0.06539

**Table VI.**  
Perceptions of  
IT expertise held  
by internal auditors

internal audit practices and skills requirements for internal auditors in an e-business environment. The results presented in this paper support the view that the increased implementation of IT-based systems in business (i.e. e-business) has created a need for changes in both internal audit practices and in the expertise requirements for internal auditors.

The overall findings indicate that while operating in an e-business environment does not fundamentally change the nature of the internal audit procedures, it does increase the salience of IT issues during the phases of audit planning and implementation. In line with the literature, the respondents believed that conducting the internal audit in an e-business environment requires internal auditors to adjust the audit plan to take various factors into consideration: the new IT risks; associated IT controls and security measures; appropriate testing techniques; and the necessity for using more advanced CAATs. Respondents also believed that in an e-business environment, the proportion of IT audit tasks increases and, in turn, that there is an increasing relevance for and need to include IT audit expertise in internal audit teams.

The finding that generalist internal auditors were less confident about their own IT audit training and expertise and, also, of that of their colleagues, suggests that there is a need to develop and maintain a specialized set of expertise relating to IT audits for generalist internal auditors operating in an e-business environment. The CIA certification may not embrace sufficient IT audit knowledge to perform IT audits and as shown in Table V, while 25 per cent of the respondents felt it was appropriate, 75 per cent recommended the CISA qualification, making it clearly the preferred existing qualification for those working in this environment as internal auditors. The fact that a quarter of the respondents recommended the CIA qualification may be due, in part, to the tendency reported in the literature to outsource e-business audit to specialist IT auditors. Respondents lent support to this interpretation by indicating that IT audit specialists are taking a much greater role in e-business internal audit compared with non-e-business internal audit, participating in almost all phases of the audit process.

In light of these findings, it would be reasonable to conclude that generalist internal auditors are responding to e-business audit requirements as they used to do with non-e-business audits of computerized accounting systems – by increasing the dependence of organizations on their IT internal audit teams or through the outsourcing of the IT internal audit function to consultants. Thus, it does appear that, in support of the literature, generalist internal auditors are ignoring the IT “elephant in the room” when working in an e-business environment, possibly because they are not traditionally equipped through their education/training process to deal with the highly technical nature of testing required in an e-business environment, something which should be a cause for concern.

Overall, organizations have moved and are moving relentlessly towards greater and greater use of IT in business, resulting in changes in what internal auditors audit and how they audit. Generalist internal auditors clearly have an important role in applying their traditional accounting and auditing skills. However, if they expect to continue to be of value to their organizations, it is essential that they understand and possess greater expertise of IT audit practice than they indicated in this study.

In the post-corporate governance world, organizations are now requesting internal auditor assistance with evaluating risk management processes, exploring new technologies, and encouraging departments within the organization to adopt best

practices. To perform these new duties, internal auditors need a broader array of competencies, including stronger IT skill sets. Internal auditors not only need the requisite knowledge to evaluate IT general controls, such as IT security controls, but also need to be able to use computer assisted audit techniques during the audit to improve audit effectiveness (Pryal, 2008; PWC, 2011).

Furthermore, in an e-business environment the degree of reliance on IT audit specialists increases as the relative amount of IT-related work rises. Ultimately, given the recent growth of e-business and the inability of the generalist internal auditors to perform some audit tasks without the support of IT specialists, this situation may reach a point when a generalist internal auditor is unable to determine whether the internal audit process is operating effectively.

To overcome this knowledge gap in such a continually evolving IT-based environment, internal audit departments should consider educating their audit team about IT audits by providing them with continuing professional education or in-house training related to IT audits. At the same time, there may be a need to revisit and update the education of internal auditors and, effectively, ensure they are all capable of working effectively in an e-business environment. This would not only positively affect the efficiency and quality of the internal audit function, it would also prevent much of the generalist internal auditor's role being taken over by IT audit specialists. In turn, it would also help internal auditors sustaining their professional role and claims as members of a professional group. Since IT audit specialists include those who have little knowledge of the concepts of auditing and lack professional accounting and auditing qualifications (Kotb *et al.*, 2012), any increase in the representation of such IT audit specialists could threaten the quality of the internal audit. Should they ultimately replace the generalists, this would represent another threat to the quality of the internal audit, and one which the internal audit profession should seek to avoid.

One further finding which also relates to this issue concerns the lack of significant differences in the profile of responses between the two groups of respondents. This suggests that on most issues, the situation is similarly perceived by both groups. If, as seems evident in the responses to this survey, generalist internal auditors are conscious of the problems of increasing automation of business processes in an e-business environment, they surely ought to be doing something about it. That they do not appear to be doing so resonates of a complacency that even a tendency for IT issues to be subcontracted is unlikely to address sufficiently to ensure the long-term survival of generalist internal auditors in an e-business environment.

These findings provide empirical evidence which supports and adds to the work of Kotb *et al.* (2012) and Kotb and Roberts (2011) in the field of auditing; and it extends our understanding by contradicting the stereotypical expansionist image of the accounting/auditing profession through examining a situation (i.e. e-business internal audit) in which accounting/auditing professionals may lose their traditional authority to another rival profession (i.e. IT auditors). While the scale of this study limits the extent to which the findings may be generalized, they are consistent with the literature concerning the changing business environment and with the literature on resistance to change, suggesting that the issues revealed should be of concern. This study should therefore serve as a wake-up call to the profession to proactively take steps to address this perceived challenge.

Finally, the findings of this study suggest a number of possibilities for future research such as investigating internal auditing roles in different types of e-business models, and how the technical complexity level of each model affects the nature and

severity of IT risks, associated mitigating processes, testing techniques, and CAATs used. Future research could also investigate the education of internal auditors and of how it could be made more relevant to today's increasingly electronic business environment.

#### Notes

1. Continuous auditing is a methodology that enables independent auditors to provide written assurance on a subject matter using a series of auditors' reports issued simultaneously with, or a short period of time after, the occurrence of events underlying the subject matter (American Institute of Certified Public Accountants and Canadian Institute of Chartered Accountants, 1999).
2. This is a British metaphorical idiom that applies to an obvious truth/problem or a controversial issue, but which is ignored or unaddressed by a group of people – see, for example, Gray (2009).
3. For more detailed demographic information describing the online survey respondents, see tables AI, AII, and AIII in the Appendix.
4. No significant difference was found between the two groups with  $p$  value 0.54716.
5. There was no significant difference found when split responses to all questions by years of experience ( $>5$  years vs  $\leq 5$  years) or by country of location (North America vs others).

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(The Appendix follows overleaf.)

		No.	%
<i>A. Respondent role</i>			
Generalist internal auditor		43	57
Specialist IT auditor	14 (18%)	33	43
Specialist IT auditor and Generalist internal auditor	19 (25%)		
<i>B. Years of experience as specialist IT auditor</i>			
1-5 years		13	43
6-10 years		11	37
11-15 years		5	17
16-20 years		1	3
<i>C. Years of experience as internal auditor role</i>			
1-5 years		16	35
6-10 years		9	20
11-15 years		8	17
16-20 years		4	8
> 20 years		9	20
<i>D. Academic qualification</i>			
Non-accounting bachelor's degree		41	54
Accounting bachelor's degree		28	37
MBA		22	29
Master's of accounting degree		6	8
Other master's degree		7	9
PhD		2	3
None		4	5
<i>E. Professional qualification</i>			
IIA		55	73
ISACA		27	36
AICPA		11	15
CIPFA		7	9
Others		24	32
None		4	5
<i>F. IT professional qualifications</i>			
CISA		23	34
IIA IT Auditing Certificate or IIA Qualification in Computer Auditing		5	7
Others		21	31
None		37	54

**Table AI.**  
Demographics of  
the respondents

**Notes:**  $n = 79$ . A small number of respondents failed to answer all the questions; and some questions permitted multiple answers

Industry	No.	%
Accommodation and food services	1	1
Arts, entertainment, and recreation	3	4
Health care and social assistance	5	7
Educational services	12	16
Professional, scientific, and technical services	11	15
Finance and insurance	12	16
Transportation and warehousing	4	5
Retail trade	1	1
Manufacturing	6	8
Construction	1	1
Mining, quarrying, and oil and gas extraction	1	1
Public administration	14	19
Utilities	2	3

**Note:**  $n = 73$

**Table AII.**  
Industries represented  
by respondents

Country	No.	%
USA and Canada	46	62
UK and Ireland	19	26
Others	9	12

**Note:**  $n = 74$

**Table AIII.**  
Countries represented  
by respondents

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