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# An Examination of Audit Information Technology Use and Perceived Importance

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**SYNOPSIS:** Information technology (IT) use can directly impact audit judgment and ultimately audit effectiveness and efficiency. Although IT has significantly changed the audit process, few studies have examined the perceived importance of IT use across a diverse group of audit firms. Our descriptive study explores audit IT use and its perceived importance across several audit applications. To address regulator concerns about barriers to entry in public accounting and to advance auditing research, we examine whether audit IT use and perceived importance of IT varies by firm size. A field-based questionnaire was used to collect data from 181 auditors representing Big 4, national, regional, and local firms. Our results indicate that auditors extensively use a variety of audit applications including analytical procedures, audit report writing, electronic work papers, Internet search tools, and sampling. Auditors perceive several applications as important (e.g., fraud review), but use them infrequently. In addition, IT specialists use is infrequent, even by auditors who examine clients with complex IT. Finally, findings suggest that audit IT use and perceived importance vary by firm size. These results describe audit IT use, but do not allow us to infer causality.

**Keywords:** information technology; firm size; audit applications.

**Data Availability:** Data are available from the first author.

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## INTRODUCTION

While the impact of information technology (IT)<sup>1</sup> in business has grown exponentially in the past two decades, few studies examine the use and perceived importance of IT,<sup>2</sup> particularly outside of the largest audit firms (Fischer 1996; Banker et al. 2002). This issue is important since IT has dramatically changed the audit process. Standards now encourage auditors and audit firms to adopt IT and use IT specialists when necessary (American Institute of Certified Public Accountants [AICPA] 2001, 2002b, 2005, 2006; Public Company Accounting Oversight Board [PCAOB] 2004b). However, auditing researchers and practitioners have little guidance available on what IT has been or should be adopted.

Large audit firms have made significant investments in IT (Banker et al. 2002; O'Donnell and Schultz 2003). However, only a modest amount of descriptive research documents (1) the extent auditors and audit firms use IT for specific audit applications, or (2) IT use by non-Big 4 auditors and audit firms. Smaller audit firms may not be able to compete with larger firms on IT investments, resulting in potential economic barriers to entry as well as audit effectiveness and efficiency issues (Public Oversight Board [POB] 2000; General Accounting Office [GAO] 2003). It is likely that the "deep pockets" of the Big 4 firms enable these firms to (1) purchase and implement superior IT, and (2) use IT specialists to a greater extent than non-Big 4 firms, potentially resulting in higher quality audits. Furthermore, previous research has not addressed the extent to which "second tier" non-national firms have used IT applications, despite the fact that these firms have an increasing number of Securities and Exchange Commission (SEC) clients (International Accounting Bulletin 2005). National firms are likely to have more resources to devote to audit IT than local or regional firms, but less than Big 4 firms. Therefore, we also examine whether national firms' audit IT practices are similar to Big 4 firm practices or to practices of smaller firms.

This study provides data on how auditors employed by firms of diverse sizes use audit IT and their perceptions of the importance of audit IT. The results answer some research questions and suggest opportunities for future research. These findings are important to standard setters, researchers, and practitioners. Solomon and Trotman (2003, 409) suggest that the audit profession is "rapidly advancing in response to changes in its environment." In recognition of these environmental changes, recent standards encourage auditors to adopt IT (AICPA 2001, 2002a, 2002b, 2002c, 2006; PCAOB 2004a). Our work provides standard setters with information on the extent to which auditors have adopted and are using IT, and areas where IT could be but generally is not currently used.

Furthermore, several researchers and regulators have raised concerns about the ability of small audit firms to compete with larger firms in today's environment (Manson et al. 1998; POB 2000; GAO 2003). For example, the Panel on Audit Effectiveness recently suggested that the AICPA develop tools to enhance the effectiveness of small firm client acceptance processes (POB 2000, 18). In addition, regulators are currently studying barriers to entry within public accounting (GAO 2003). A wide discrepancy in IT use and perceived importance between small and large audit firms may (1) suggest that barriers to entry exist, and (2) identify areas where smaller firms may need assistance to remain competitive.

<sup>1</sup> *Information technology* refers to "the automated means of originating, processing, storing, and communicating information, and includes recording devices, communication systems, computer systems (including hardware and software components and data), and other electronic devices" (AICPA 2007, AU 319.02).

<sup>2</sup> *Audit IT use* refers to the extent auditors employ or use IT throughout the audit process. *Perceived importance of IT use* refers to the degree of importance that auditors attach to the use of IT during the audit process.

Audit judgment impacts audit quality and effectiveness (Bonner 1999; Bell et al. 2002; Wright 2002). Decision tools may impact audit judgment. Therefore, to understand audit judgment, researchers must determine which decision tools (including IT) auditors use. However, few studies examine actual audit IT use or factors that influence audit IT use, such as firm size (Fischer 1996; Arnold and Sutton 1998). Finally, because we examine IT use and perceived importance across firm size, practitioners may use our results as a benchmark as they evaluate their IT adoption and usage efforts and assess the extent to which they are able to compete with firms of similar size.

The remainder of the article is organized as follows. In the next section we review the impact of IT on the profession and discuss how firm size may be an important factor in this process. Next, we discuss the methodology and present the results of our study. Finally, we discuss the results and offer important implications for future research.

## BACKGROUND

### Impact of IT on the Audit Profession

IT has significantly impacted the audit profession in the past two decades. First, firms are increasingly using electronic work papers to facilitate documentation (PricewaterhouseCoopers 2003). Second, large firms are developing computerized decision aids to assist them in, for example, going concern decisions, client acceptance issues, and analytical procedures (Bell and Carcello 2000; O'Donnell and Schultz 2003; Dowling and Leech 2007). Third, even small audit firms have been encouraged to adopt IT, such as electronic work papers (POB 2000). Fourth, IT impacts the behavior and attitudes of individuals working in the firm and the structure and processes of the firm (Coombs et al. 1992). For example, IT use could reduce the time auditors spend performing computational and/or clerical tasks and improve the quality of audit judgments by structuring audit decision processes (Manson et al. 1998). Fifth, IT appears to increase audit quality and productivity through audit automation, eliminating certain audit procedures, and enhancing information and knowledge-sharing capabilities (Manson et al. 1998; Vera-Munoz et al. 2006). Finally, several recent standards codify the increased role for IT in audit practice (AICPA 2001, 2002b, 2005, 2006; PCAOB 2004b).

Information systems researchers have proposed several theories to understand why individuals and organizations adopt IT: for example, theory of reasoned action (Ajzen and Fishbein 1980), social cognition theory (Bandura 1986), technology acceptance model (Davis 1989), theory of planned behavior (Ajzen 1991), unified theory of acceptance and use of technology (Venkatesh et al. 2003), and innovation diffusion theory (Jeyaraj et al. 2006). However, before we can understand why auditors and audit firms adopt certain types of IT, we must identify and document current auditor IT use and perceived importance. Interestingly, despite the impact of IT on the audit profession and calls by prior research (i.e., Bailey et al. 1988), few studies have examined audit IT use, or the perceived importance of specific applications and tools (Arnold and Sutton 1998; Liang et al. 2001). The changing role of IT in auditing as well as rapid changes in IT may help explain the sparseness and disjointed nature of this research stream. These significant changes in IT also limit the extent to which the findings of earlier studies can be generalized to the current audit environment. Thus, our first two research questions (RQs) are:

**RQ1:** What types of IT do auditors use most frequently?

**RQ2:** What types of IT do auditors rate as more important?

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### The Association of Firm Size with IT Use and Perceived Importance

The limited amount of research related to auditors' use of IT has primarily focused on the impact of IT in large audit firms. Therefore, it is unclear whether audit IT use or perceived importance varies by firm size. Firm size varies greatly within the audit profession, from local one-office firms to international Big 4 firms (Brierley and Gwilliam 2001). Recently, interest has increased in the activity of non-Big 4 firms. That is, the Sarbanes-Oxley Act of 2002 (SOX) (U.S. House of Representatives 2002) has had the effect of providing growth opportunities to local, regional, and national firms (Accounting Office Management and Administration Report 2005; Dennis 2005; Rozycki 2005). Furthermore, incidences have increased of Big 4 firms "firing" risky clients, who then turn to non-Big 4 firms to be their auditors (Cheney 2004).

Prior research has suggested that Big 4 audits provide higher quality audits and offer greater credibility to clients' financial statements than small audit firms (Lennox 1999a, 1999b; Palmrose 1988). A primary explanation for this is the large amount of resources that large firms have available to potential claimants. Audit firms are often referred to as possessing "deep pockets" because CPA firms often carry malpractice insurance, or in many instances, are the only solvent defendants (Hillison and Pacini 2004). Therefore, audit firms with more wealth at risk from litigation have more incentive to provide higher quality audits (Dye 1993; Reed et al. 2000).

The abundant resources available to Big 4 firms may also enable these firms to (1) purchase and implement superior IT, and (2) use IT specialists to a greater extent than do non-Big 4 firms. Thus, these resources should enhance and facilitate improved audit processes leading to better audits. Information systems research indicates that IT adoption is driven by the availability of firm resources (Riemenschneider et al. 2003). Prior research finds that broad audit IT use is more extensive in Big 4 firms as compared with smaller firms (Manson et al. 1998). In fact, regulators are concerned that small audit firms may not be able to compete with larger firms in terms of IT investment (POB 2000; GAO 2003). This may be because of the differences between the size of the clients serviced by these firm types and their corresponding IT needs. Thus, we expect that IT use and perceived importance may differ between Big 4 firms and non-Big 4 firms. Furthermore, given the lack of research into the IT audit practices of national firms, it is unclear whether they operate more like the Big 4 firms or tend to be similar to smaller firms. Therefore, our research questions are as follows:

**RQ3:** Does audit IT use vary by firm size?

**RQ4:** Does audit IT importance vary by firm size?

## METHOD

### Participants

Participants included 181 auditors from Big 4, national, regional, and local firms (see Table 1). One researcher attended the AICPA National Advanced Accounting and Auditing Technical Symposium to obtain responses from 109 auditors. We also contacted local offices of each Big 4 firm and one national firm. From these offices, we collected data from 72 auditors. All responses were collected after SOX.

**TABLE 1**  
**Participant Demographics**

|   | <u>Frequencies</u> | <u>Mean or Percent<br/>(Std. Dev.)</u> |
|---|--------------------|--|
| Years as an External Auditor <sup>a</sup> |                    | 12.7<br>(9.4)                          |
| Age <sup>a</sup>                          |                    | 36.5<br>(10.0)                         |
| Highest Education Level <sup>a</sup>      |                    |  |
| Bachelor Degree                           | 149                | 82.8%                                  |
| Master Degree                             | 29                 | 16.1%                                  |
| Coursework Beyond Master Degree           | 2                  | 1.1%                                   |
| Certification <sup>a,b</sup>              |                    |  |
| Certified Internal Auditor                | 1                  |  |
| Certified Public Accountant               | 156                |  |
| Certified Information Systems Auditor     | 0                  |  |
| Certified Management Accountant           | 1                  |  |
| Certified Financial Executive             | 8                  |  |
| Certified Financial Planner               | 0                  |  |
| Other Certification                       | 1                  |  |
| Gender <sup>a</sup>                       | M = 127<br>F = 52  | 71.0%<br>29.0%                         |
| Firm Size <sup>a</sup>                    |                    |  |
| Big 4                                     | 55                 | 31.1%                                  |
| National                                  | 31                 | 17.5%                                  |
| Regional                                  | 26                 | 14.7%                                  |
| Local                                     | 65                 | 36.7%                                  |
| IT Expertise <sup>a</sup>                 |                    |  |
| Novice                                    | 30                 | 16.7%                                  |
| Intermediate                              | 127                | 70.5%                                  |
| Expert                                    | 23                 | 12.8%                                  |

<sup>a</sup> One or more participants did not answer question.

<sup>b</sup> Participants could list more than one certification.

Respondents averaged 12.7 years of external audit experience; their average age was 36.6 years.<sup>3</sup> Thirty-one percent of respondents were employed by Big 4 firms, 17 percent by national firms, 15 percent by regional firms, and 37 percent by local firms. The highest educational level for a significant majority (82.8 percent) was a bachelor's degree. Most respondents (86.2 percent) held CPA certificates. The majority of the respondents (70.9 percent) were male. Participants varied in IT expertise with 70.5 percent indicating intermediate IT expertise, 16.7 percent stating they were IT novices, and 12.8 percent indicating that they were IT experts.<sup>4</sup>

<sup>3</sup> Since experience varied by firm size, we include experience as a covariate when analyzing the impact of firm size on IT. In spite of these experience differences, we find that our results are driven primarily by firm size differences.

<sup>4</sup> Prior research indicates that gender, IT expertise, and audit approach may have an effect on IT use and importance. Our analyses of these variables indicate that IT use and perceived importance do not differ by any of these variables, with the exception of IT expertise. Specifically, respondents with more IT expertise were more likely to use and assign higher importance ratings to two audit applications (electronic work papers and graphs) and one productivity tool (personal digital assistants).

## Instrument Development and Validation

### Pilot Testing

To increase construct validity, we conducted two rounds of pilot testing. Four researchers with significant audit and systems knowledge examined the instrument. We then pilot tested the revised instrument with eight auditors from four firms (Big 4, national, regional, and local) who had an average of 4.5 years of experience. Based on the pilot testing, we revised the wording of some audit applications and eliminated one productivity tool, verified that participants were able to consistently define each IT, and confirmed that participants correctly interpreted the wording of the frequency and extent of the IT specialist question.<sup>5</sup>

### Categories of Audit IT

We designed our instrument to elicit a wide variety of audit IT. Following prior research, we adopted a relatively broad definition that suggests that *audit IT* refers to “the auditor’s tool kit” (Elliott and Jacobson 1987, 198; Fischer 1996, 220). Elliott and Jacobson (1987, 198) argue, “A tool may be thought of as anything that enhances an individual’s capacity to perform a task. Audit IT consists of all the things designed to enhance the auditor’s capacity to perform an audit task.” We propose that audit IT encompasses audit applications, productivity tools, work paper review technology, and the use of IT specialists.

### Audit Applications

We used the term *audit applications* to describe software designed to assist auditors in completing one or more tasks. We reviewed prior literature and held discussions with both practitioners and researchers to identify 20 audit applications. These applications included those examined previously: for example, analytical procedures (Knechel 1988), internal control evaluation (Bailey et al. 1985), and sampling tasks (Kachelmeier and Messier 1990). They also included recent applications such as those developed to assist with audit tasks: for example, fraud review (Bell and Carcello 2000), testing online transactions (Wright 2002), administrative/practice management tasks such as client relationship management (Bauman et al. 2006), and knowledge management (O’Leary 2002). We grouped the audit applications according to audit task functions (i.e., client acceptance and audit planning, audit testing, audit completion and report writing, and administrative/practice management).

### IT Productivity Tools

We define *productivity tools* as IT tools, such as email, cell phones, instant messaging, and personal digital assistants designed to increase personnel productivity. Increasing personnel productivity often increases product quality and efficiency (Hunton 2002).

### Work Paper Review Methodology

Several recent studies examined the audit work paper review process (Sprinkle and Tubbs 1998; Bamber and Ramsey 2000). In a recent study, Brazel et al. (2004) reported that electronic review of work papers rather than a traditional face-to-face meeting between

<sup>5</sup> Pilot testing provided us feedback on two specific instrument design issues. First, we considered developing a specific audit scenario in which we could ask respondents to indicate their extent of IT use regarding that scenario. Interestingly, discussions with pilot study participants questioned the value of this approach since their responses would be to a fictitious scenario that some would not be familiar with. Second, we considered asking participants to select one specific audit and indicate if they used each audit application and productivity tool in that *selected* audit. However, since IT use is generally fairly consistent across clients, we elected to ask participants to indicate if they used each audit application and productivity tool in a *typical* audit.

the preparer and reviewer may reduce auditors' feelings of accountability, resulting in auditors performing their work less thoroughly. We examined the use of three methods: email, face-to-face meetings, and telephone.

### ***Use of IT Specialist***

IT specialists are individuals within an audit firm who have detailed knowledge in computer auditing. Audit standards encourage the use of IT specialists when (1) the client's business has complex systems and IT controls, (2) the client replaces or makes significant changes to its IT systems, (3) the client shares data extensively between systems, (4) the client participates in electronic commerce, (5) the client uses emerging technology, or (6) significant audit evidence is only available electronically (AICPA 2007, AU 319.30). We asked respondents to indicate both how frequently they consulted IT specialists and the extent of IT specialist use during the past year. We anticipated that the use and extent of IT specialists would vary by client IT complexity and firm size.

### ***Measuring Extent of Use and Perceived Importance***

For each audit application and productivity tool, respondents indicated (1) the extent of use on a typical audit, and (2) the perceived importance for a typical audit.<sup>6</sup> Several information systems studies used *extent of usage* to represent the IT usage theoretical construct (Straub et al. 1995; Venkatesh et al. 2003). Data on perceived importance were collected from auditors to measure differences in perceived importance between various applications and tools (see Sprinkle and Tubbs 1998, 477). Frequency of use (i.e., how frequently an IT specialist was used during audit engagements over the past year) and extent of use were used to examine use of IT audit specialists.

### ***Firm Size***

To collect firm size information, each respondent indicated whether he or she was currently employed by a Big 4, national, regional, or local firm.

## **RESULTS**

### **Use and Importance of Audit Applications**

As noted earlier, we propose that audit IT encompasses audit applications, productivity tools, work paper review technology, and the use of IT specialists. Thus, to address RQ1 and RQ2, we report results grouped by audit IT category.

Descriptive statistics, shown in Table 2, indicate that audit application use and perceived importance vary significantly. For example, respondents rated the extent of use as being moderately high (means ranged from 4.53 to 5.39) for five applications (electronic work papers, analytical procedures/financial ratio tools, Internet search tools, audit report writing, and sampling) while assigning lower extent of usage ratings to newer applications, such as expert systems, digital analysis, database modeling, test of online transactions, and continuous transaction monitoring. Similarly, participants assigned the highest importance ratings

<sup>6</sup> During our initial research development phase, we carefully considered whether to measure the benefits of IT at the firm or individual level. As noted earlier, one of our research goals was to examine IT use at audit firms of various sizes. If we measured IT benefits at the firm level, we would need to obtain consent from each firm to examine their audit manuals and interview key personnel. Obtaining this consent and conducting these procedures would significantly reduce the number of firms we could examine. Thus, we measured the impact of IT at the individual level, consistent with prior research (Fischer 1996). An advantage of this approach is that we can assess the IT auditors actually use, instead of inferring this from firm policy data. A disadvantage of this approach is that it fails to distinguish individual and firm-level effects, which would be detected in a multilevel or hierarchical linear model.

**TABLE 2**  
**Use and Importance of Information Technology Audit Applications**

| <b>Audit Application</b>                             | <b>Extent of Use<sup>a</sup><br/>Mean<br/>(Std. Dev.)</b> | <b>Level of<br/>Importance<sup>b</sup> Mean<br/>(Std. Dev.)</b> |
|--|---|---|
| <b>Panel A: Client Acceptance and Audit Planning</b> |   |   |
| Analytical Procedures/Financial Ratio Tools          | 5.06 (1.63)   | 5.50 (1.36)   |
| Internet Search Tools                                | 4.60 (1.84)   | 4.75 (1.87)   |
| Audit Planning Software                              | 4.20 (2.33)   | 4.99 (2.01)   |
| Risk Assessment                                      | 4.09 (2.33)   | 4.73 (2.28)   |
| Client Acceptance                                    | 3.58 (2.41)   | 4.45 (2.22)   |
| <b>Panel B: Audit Testing</b>                        |   |   |
| Sampling   | 4.53 (2.07)   | 4.91 (2.05)   |
| Internal Control Evaluation                          | 3.90 (2.36)   | 4.77 (2.30)   |
| Data Mining  | 2.60 (1.93)   | 3.82 (2.16)   |
| Continuous Transaction Monitoring                    | 1.90 (1.56)   | 2.92 (1.97)   |
| Test of Online Transactions                          | 1.87 (1.63)   | 2.61 (2.16)   |
| Database Modeling                                    | 1.85 (1.51)   | 2.62 (1.75)   |
| Digital Analysis                                     | 1.67 (1.37)   | 2.31 (1.70)   |
| <b>Panel C: Audit Completion and Report Writing</b>  |   |   |
| Audit Report Writing                                 | 4.55 (2.28)   | 5.05 (2.00)   |
| Fraud Review   | 2.83 (2.02)   | 4.18 (2.29)   |
| Review Client's Financial Disclosures On Website     | 2.55 (2.00)   | 3.02 (2.21)   |
| <b>Panel D: Administrative/Practice Management</b>   |   |   |
| Electronic Work Papers                               | 5.39 (2.11)   | 5.79 (1.74)   |
| Client Relationship Management                       | 2.90 (2.09)   | 3.95 (2.18)   |
| Graphs   | 2.69 (1.59)   | 2.92 (1.73)   |
| Knowledge Management Systems <sup>c</sup>            | 2.45 (2.01)   | 2.97 (2.34)   |
| Expert Systems                                       | 1.64 (1.43)   | 2.19 (1.90)   |

<sup>a</sup> Participants rated "the extent of use for each audit application on a typical audit" using a seven-point scale where 1 = none and 7 = extensive.

<sup>b</sup> Participants rated "the importance of each audit application for a typical audit" using a seven-point scale where 1 = not important and 7 = very important.

<sup>c</sup> Knowledge management systems refer to efforts to (1) capture knowledge, (2) convert personal knowledge to group-available knowledge, (3) connect people to knowledge, and (4) measure knowledge (O'Leary 2002).

to electronic work papers, analytical procedures/financial ratio tools, electronic audit report writing, audit planning software, sampling, Internet search tools, internal control evaluation, and risk assessment. Interestingly, auditors indicated that IT was important for several applications (audit planning, risk assessment, internal control evaluation, client acceptance, client relationship management, and fraud review) although not used extensively, suggesting some potential applications where audit firms could consider expanding the use of, or training with, IT. Standard setters may also consider issuing guidance to practitioners regarding the use of IT in these areas.



### Use and Importance of Productivity Tools

Descriptive statistics for productivity tool use and perceived importance also vary significantly, as shown in Table 3. Email, cell phones, and remote network access had the highest extent of use means while respondents assigned lower extent of use ratings to extensible business reporting language and instant messaging. Similarly, respondents assigned higher importance ratings to email, cell phones, and remote network access.

### Work Paper Review Method Used

The most common method of work paper review, reported in Table 4, is face-to-face meetings (60.9 percent), followed by email (27.7 percent). Therefore, given concerns about reduced accountability for electronic review of work papers (Brazel et al. 2004), it appears

**TABLE 3**  
Use and Importance of Information Technology Productivity Tools

| <u>Productivity Tool</u>                      | <u>Extent of Use<sup>a</sup></u><br>Mean (Std. Dev.) | <u>Level of Importance<sup>b</sup></u><br>Mean (Std. Dev.) |
|---|--|--|
| Email   | 6.17 (1.41)  | 6.17 (1.49)  |
| Cell Phones                                   | 4.69 (2.05)  | 4.76 (2.08)  |
| Remote Network Access                         | 4.28 (2.49)  | 4.92 (2.37)  |
| Personal Digital Assistants (PDAs)            | 2.63 (2.23)  | 2.81 (2.20)  |
| Wireless Networks                             | 2.62 (2.19)  | 3.39 (2.37)  |
| Instant Messaging                             | 2.08 (1.94)  | 2.12 (1.99)  |
| Extensible Business Reporting Language (XBRL) | 1.16 (0.69)  | 1.72 (1.57)  |

<sup>a</sup> Respondents rated "the extent of use for each audit application on a typical audit" using a seven-point scale where 1 = none and 7 = extensive.

<sup>b</sup> Respondents rated "the importance of each audit application for a typical audit" using a seven-point scale where 1 = not important and 7 = very important.

**TABLE 4**  
Frequency of Work Paper Review Methods Use

| <u>Work Paper Review Method<sup>a</sup></u> | <u>Mean (Std. Dev.)</u> |
|---|-------------------------|
| Face-to-Face                                | 60.87%<br>(34.67)       |
| Email <sup>b</sup>                          | 27.69%<br>(34.23)       |
| Telephone <sup>c</sup>                      | 9.97%<br>(16.99)        |
| Other <sup>d</sup>                          | 10.61%<br>(19.78)       |

<sup>a</sup> Respondents estimated how frequently (0 to 100 percent) each method was used when conducting a typical audit work paper review (e.g., between staff and senior, or senior and manager).

<sup>b</sup> Email refers to "preparer forwards work papers electronically to the reviewer; the reviewer examines the file online, and sends his or her comments back electronically."

<sup>c</sup> Telephone refers to "feedback provided via phone conversion and voice mail messages."

<sup>d</sup> The most common other response was "hard copy review."

somewhat reassuring that face-to-face reviews are still used in a majority of cases. However, as discussed below, these results vary by firm size.

**Use of IT Specialist**

As shown in Table 5, Panel A, auditors did not use IT specialists frequently on a typical audit, as 24.5 percent was the average response to the question, “How frequently was an IT specialist used during audit engagements over the past year?” The extent of IT specialist use was also fairly low as the mean extent response was 2.59 on a scale anchored with 1 = none and 7 = extensively. These findings may echo concerns that auditors are reluctant to consult IT specialists because of audit efficiency considerations (Carmichael 2004, 132) and potential overconfidence in their ability to recognize IT risks (Hunton et al. 2004). Recent research by Brazel and Agoglia (2006) indicates auditors still perceive substantial variation in the competence of IT specialists, which may diminish their use in practice.

Standards encourage auditors to use IT specialists for clients with complex financial reporting systems (AICPA 2007, AU 319.31). To determine if use of IT specialists is related to the complexity of the client’s financial reporting systems, we ran cross tabulations and Pearson correlations examining frequency of IT specialist use and client IT complexity.<sup>7</sup> To obtain information about client IT complexity, respondents were asked to rate the complexity of their typical client’s IT using a seven-point scale with 1 = manual processing and 7 = highly computerized financial reporting system. The mean client IT complexity

**TABLE 5**  
**Frequency and Extent of IT Specialist Use and Cross-Tabulation with Client IT Complexity**

**Panel A: Frequency and Extent of Use of IT Specialists**

|  | <u>Mean (Std. Dev.)</u> |
|--|-------------------------|
| Frequency of IT Specialist Use Over Past Year <sup>a</sup> | 24.46%<br>(33.68)       |
| Extent of IT Specialist Use Over Past Year <sup>b</sup>    | 2.59<br>(2.23)          |

**Panel B: Frequency of IT Specialist Use Cross-Tabulated with Client IT Complexity**

|   | <u>High Client IT<br/>Complexity n<sup>d</sup></u> | <u>Low Client IT<br/>Complexity n<sup>d</sup></u> |
|---|--|---|
| High Frequency of IT Specialist Use Over Past Year <sup>c</sup> | 46   | 14  |
| Low Frequency of IT Specialist Use Over Past Year               | 44   | 68  |

Chi-Square = 21.9; p < 0.01

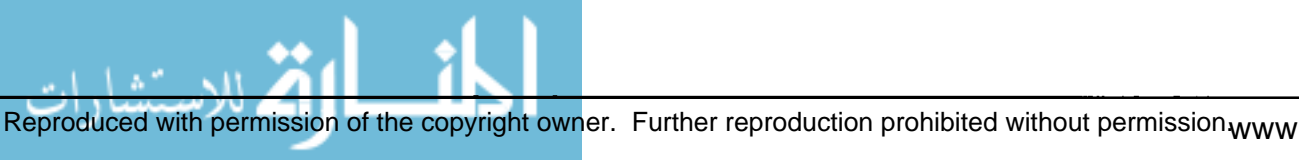
<sup>a</sup> Respondents estimated how frequently (0 to 100 percent) an IT specialist was used during audit engagements over the past year.

<sup>b</sup> Respondents rated the extent of IT specialist use during audit engagements over the past year from 1 = none to 7 = extensively.

<sup>c</sup> Frequency of IT specialist use is split at the mean of 24.46 percent.

<sup>d</sup> Client IT complexity is split at the mean of 4.63 on a scale of 1 = manual processing to 7 = highly computerized financial reporting system.

<sup>7</sup> We also examined and found a significant positive correlation between *extent* of IT specialist use and client IT complexity (r = 0.46; p < 0.001). These results are similar to the relationship of *frequency* of IT specialist use and client IT complexity shown in Table 5, Panel B.



rating for all respondents was 4.63. As expected, cross tabulation results, shown in Table 5, Panel B, suggest that the frequency of IT specialist use is lower when auditors examine clients with low IT complexity. Pearson correlation results indicate that frequency of IT specialist use and client IT complexity ( $r = 0.48$ ;  $p < 0.001$ ) are positively correlated.

### The Association of Firm Size with Audit IT Use and Perceived Importance

Since regulators are concerned that small audit firms may not be able to compete with larger firms because of the level of IT investment required (GAO 2003), our remaining research questions examine whether audit IT use and perceived importance vary by firm size. We used ANCOVA tests with experience as the covariate and firm size as the independent variable.<sup>8</sup> For audit applications where use or perceived importance varied by firm size, we conducted *post hoc* comparisons<sup>9</sup> to determine whether the use and perceived importance of the particular audit IT varied between (1) Big 4 and non-Big 4 firms, (2) Big 4 and national firms, and (3) national and smaller firms (i.e., RQ3 and RQ4).<sup>10</sup>

As shown in Table 6, ANCOVA results suggest that firm size is associated with auditors' use and perceived importance for several audit applications. Further analysis related to RQ3 and RQ4 indicates that auditors from Big 4 firms were significantly more likely to use IT and rate its importance higher than non-Big 4 auditors for two audit testing applications (internal control evaluation and testing online transactions), two audit completion applications (fraud review and reviewing client website financial disclosures), and three administrative/practice management applications (electronic work papers, expert systems, and knowledge management systems). However, auditors from non-Big 4 firms were significantly more likely to use audit report writing applications than were Big 4 auditors.

Furthermore, we found that IT audit practices of national firms vary by application as to whether they are more comparable with Big 4 or smaller firms. For example, auditors employed by national firms rated their use and perceived importance for audit report writing, knowledge management systems, and reviewing client web-based financial disclosure applications similarly to auditors from small firms. However, auditors from national firms rated their use and perceived importance for electronic work papers, sampling, and their use of expert systems, fraud review, and internal control evaluation as being more consistent with Big 4 auditors.

Table 7 displays ANCOVA results for productivity tools. Auditors from Big 4 firms were significantly more likely to use and assign higher importance to email and remote network access tools than were non-Big 4 auditors. Firm size also appears to impact auditor use and perceived importance for instant messaging. Furthermore, auditors employed by national firms tend to use and rate importance more similarly to Big 4 rather than smaller firms for remote network access tools. In contrast, auditors from national firms tend to use instant messaging and wireless networks at levels similar to auditors at smaller firms.

We also used ANCOVA tests to examine the relationship between work paper review methods and firm size while accounting for experience as a covariate. Results regarding RQ3, shown in Table 8, suggest that Big 4 auditors reported the use of email (55.8 percent)

<sup>8</sup> We ran the ANCOVA tests using weighted least squares regression to account for differences in firm size sample cells.

<sup>9</sup> We also ran Krushal-Wallis nonparametric tests since the Brown-Forsythe F-test of homogeneous variances indicated our data contained nonhomogeneous variances. Results are qualitatively similar to the reported results.

<sup>10</sup> Before grouping responses from regional and local firms together, we ran an initial *post hoc* comparison to identify any differences between these responses. Results indicated that only four responses from regional firms (analytical review use, remote network access perceived importance, frequency of IT specialist use, and extent of IT specialist use) were statistically different than those from local firms.

**TABLE 6**  
**The Association of Firm Size with Audit Application Use and Perceived Importance Means and ANCOVA Results**

|  | Extent of Use <sup>a</sup> |          |          |       | Importance <sup>b</sup> |          |          |       | Scheffe <sup>d</sup> |
|--|----------------------------|----------|----------|-------|-------------------------|----------|----------|-------|----------------------|
|  | Big 4                      | National | Regional | Local | Big 4                   | National | Regional | Local |                      |
| <b>Panel A: Client Acceptance and Audit Planning<sup>e</sup></b> |                            |          |          |       |                         |          |          |       |                      |
| Analytical Review/Financial Ratio Tools                          | 4.76                       | 4.97     | 4.54     | 5.55  | 5.22                    | 5.47     | 5.42     | 5.82  |                      |
| Internet Search Tools  | 4.85                       | 4.42     | 4.12     | 4.77  | 5.09                    | 4.42     | 4.46     | 4.78  |                      |
| Audit Planning Software  | 4.96                       | 3.97     | 3.38     | 3.97  | 5.36                    | 4.72     | 4.42     | 5.03  | **                   |
| Risk Assessment  | 4.70                       | 4.26     | 3.50     | 3.88  | 5.54                    | 4.93     | 3.69     | 4.51  | **A                  |
| Client Acceptance <sup>f</sup>                                   | 3.89                       | 3.63     | 2.77     | 3.68  | 5.27                    | 4.30     | 3.46     | 4.35  | **                   |
| <b>Panel B: Audit Testing</b>                                    |                            |          |          |       |                         |          |          |       |                      |
| Sampling   | 5.06                       | 5.42     | 3.54     | 4.17  | 5.57                    | 5.77     | 3.73     | 4.52  | **                   |
| Internal Control Evaluation                                      | 4.94                       | 4.35     | 2.73     | 3.42  | 5.76                    | 4.94     | 3.88     | 4.35  | **                   |
| Data Mining  | 2.04                       | 2.16     | 1.50     | 1.53  | 2.59                    | 2.96     | 2.13     | 2.58  |                      |
| Continuous Transaction Monitoring                                | 2.13                       | 2.03     | 1.35     | 1.72  | 3.14                    | 3.04     | 2.35     | 2.85  |                      |
| Test of Online Transactions                                      | 2.70                       | 1.84     | 1.42     | 1.31  | 3.89                    | 2.90     | 2.07     | 1.84  | **                   |
| Database Modeling  | 2.04                       | 2.16     | 1.50     | 1.53  | 2.59                    | 2.96     | 2.13     | 2.58  | **                   |
| Digital Analysis   | 1.92                       | 2.20     | 1.48     | 1.28  | 2.31                    | 2.92     | 2.09     | 2.15  | **                   |

(continued on next page)

TABLE 6 (continued)

| Panel C: Audit Completion and Report Writing         |      |      |      |      |    |            |      |      |      |      |    |            |
|--|------|------|------|------|----|------------|------|------|------|------|----|------------|
| Audit Report Writing                                 | 3.55 | 4.84 | 4.65 | 5.37 | ** | **A<br>*B  | 4.44 | 5.31 | 5.46 | 5.41 | *  | **A        |
| Fraud Review   | 3.43 | 3.43 | 1.92 | 2.38 | ** | *A<br>*C   | 4.78 | 4.47 | 3.42 | 3.92 | *  | *A         |
| Review of Client's Financial Disclosures on Websites | 3.81 | 2.26 | 1.69 | 2.02 | ** | **A<br>**B | 4.36 | 2.90 | 2.54 | 2.23 | ** | **A<br>**B |
| Panel D: Administrative/Practice Management          |      |      |      |      |    |            |      |      |      |      |    |            |
| Electronic Work Papers                               | 6.77 | 6.23 | 4.12 | 4.39 | ** | **A<br>**C | 6.62 | 6.17 | 4.96 | 5.22 | ** | **A<br>*C  |
| Client Relationship Management                       | 3.02 | 3.00 | 2.35 | 3.03 |    |            | 3.90 | 4.41 | 3.73 | 3.97 |    |            |
| Graphs   | 2.53 | 2.74 | 2.19 | 2.86 |    |            | 2.63 | 3.03 | 2.54 | 3.15 |    |            |
| Knowledge Management Systems                         | 3.91 | 2.39 | 1.31 | 1.80 | ** | **A<br>**B | 4.35 | 2.94 | 2.31 | 2.26 | ** | **A<br>*B  |
| Expert Systems                                       | 2.27 | 1.93 | 1.19 | 1.20 | ** | *A<br>*C   | 3.00 | 2.40 | 1.70 | 1.73 | ** | *A         |

<sup>a</sup> Participants rated "the extent of use for each audit application on a typical audit" using a seven-point scale where 1 = none and 7 = extensive.

<sup>b</sup> Participants rated "the importance of each audit application for a typical audit" using a seven-point scale where 1 = not important and 7 = very important.

<sup>c</sup> ANCOVA results for use/importance rating differ based on firm size where \*\* indicates  $p \leq 0.01$  and \* indicates  $p \leq 0.05$  level.

<sup>d</sup> Scheffe results for use/importance rating differ based on (A) differences between Big 4 and non-Big 4 firms, (B) differences between Big 4 and national firms, and (C) differences between national and smaller (i.e., regional and local) firms where \*\* indicates  $p \leq 0.01$  and \* indicates  $p \leq 0.05$  level.

<sup>e</sup> Table displays audit applications by audit task function.

<sup>f</sup> Experience, rather than firm size, is significant at  $p \leq 0.01$  level.



**TABLE 7**  
**The Association of Firm Size with Productivity Tools Use and Perceived Importance Means and ANCOVA Results**

|   | Extent of Use <sup>a</sup> |          |          |       | Level of Importance <sup>b</sup> |          |          |       | Scheffe <sup>c</sup> | Scheffe <sup>d</sup> |
|---|----------------------------|----------|----------|-------|----------------------------------|----------|----------|-------|----------------------|----------------------|
|   | Big 4                      | National | Regional | Local | Big 4                            | National | Regional | Local |                      |                      |
| Cell Phones                                     | 4.65                       | 4.77     | 4.19     | 4.78  | 4.85                             | 5.32     | 4.31     | 4.63  |                      |                      |
| Email   | 6.71                       | 6.32     | 5.46     | 5.88  | **A                              | 6.48     | 5.61     | 5.88  | **                   | *A                   |
| Instant Messaging <sup>e</sup>                  | 3.51                       | 1.32     | 1.69     | 1.38  | **A                              | 1.63     | 2.00     | 1.48  | **                   | **A<br>**B           |
| Personal Digital Assistants (PDAs) <sup>f</sup> | 2.71                       | 1.90     | 2.35     | 3.06  | 2.96                             | 2.55     | 2.88     | 2.86  |                      |                      |
| Remote Network Access                           | 5.87                       | 4.97     | 3.35     | 2.97  | **A                              | 5.77     | 4.85     | 3.65  | **                   | **A<br>**C           |
| Wireless Networks                               | 3.87                       | 2.52     | 2.00     | 1.94  | **A                              | 3.58     | 2.96     | 3.05  |                      | **B                  |
| XBRL  | 1.12                       | 1.39     | 1.15     | 1.05  | 1.59                             | 2.23     | 1.73     | 1.60  |                      |                      |

<sup>a</sup> Participants rated "the extent of use for each audit application on a typical audit" using a seven-point scale where 1 = none and 7 = extensive.  
<sup>b</sup> Participants rated "the importance of each audit application for a typical audit" using a seven-point scale where 1 = not important and 7 = very important.  
<sup>c</sup> ANCOVA results for use/importance rating differ based on firm size where \*\* indicates p ≤ 0.01 and \* indicates p ≤ 0.05 level.  
<sup>d</sup> Scheffe results for use/importance rating differ based on (A) differences between Big 4 and non-Big 4 firms, (B) differences between Big 4 and national firms, and (C) differences between national and smaller (i.e., regional and local) firms where \*\* indicates p ≤ 0.01 and \* indicates p ≤ 0.05 level.  
<sup>e</sup> ANCOVA results suggest that experience and firm size are both significant at p ≤ 0.01 level. Bootstrap analysis indicates that use/importance ratings differ based on (A) differences between Big 4 and non-Big 4 firms, and (B) differences between Big 4 and national firms where \*\* indicates p ≤ 0.01.  
<sup>f</sup> Experience, rather than firm size, is significant at p ≤ 0.01 level.

**TABLE 8**  
**The Association of Firm Size with Frequency of Work Paper Review Method Use Means and ANCOVA Results**

| <b>Work Paper Review Method<sup>a</sup></b> | <b>Big 4</b> | <b>National</b> | <b>Regional</b> | <b>Local</b> | <b>ANCOVA<sup>b</sup></b> | <b>Scheffe<sup>c</sup></b> |
|---|--------------|-----------------|-----------------|--------------|---------------------------|----------------------------|
| Face-to-Face                                | 49.87        | 59.80           | 65.38           | 70.75        | *                         | *A                         |
| Email <sup>d</sup>                          | 55.78        | 24.70           | 12.88           | 12.46        | **                        | **A<br>**B                 |
| Telephone                                   | 19.00        | 7.32            | 3.65            | 6.09         | **                        | **A<br>*B                  |

<sup>a</sup> Respondents estimated how frequently (0 to 100 percent) each method was used when conducting a typical audit work paper review (e.g., between staff and senior, or senior and manager).

<sup>b</sup> ANCOVA results for use/importance rating differ based on firm size where \*\* indicates  $p \leq 0.01$  and \* indicates  $p \leq 0.05$  level.

<sup>c</sup> Scheffe results for use rating differ based on (A) differences between Big 4 and non-Big 4 firms, (B) differences between Big 4 and national firms, and (C) differences between national and smaller (i.e., regional and local) firms where \*\* indicates  $p \leq 0.01$  and \* indicates  $p \leq 0.05$  level.

<sup>d</sup> ANCOVA results find experience and firm size are both significant at  $p \leq 0.01$  level. Bootstrap analysis indicates that use rating differs based on (A) differences between Big 4 and non-Big 4 firms, and (B) differences between Big 4 and national firms where \*\* indicates  $p \leq 0.01$ .

and telephone (19 percent) more often than non-Big 4 auditors. Conversely, non-Big 4 auditors used face-to-face meetings (59.8 percent, 65.4 percent, and 70.8 percent for national, regional, and local firms, respectively) more often than Big 4 auditors did (49.9 percent). Further analysis suggests that auditors from national firms tend to use work paper review methods, particularly email and telephone, similarly, as do auditors employed by smaller firms rather than Big 4 firms. The frequent use of email by Big 4 auditors for work paper review may be of concern given the findings of Brazel et al. (2004), who suggest that feelings of accountability and thoroughness of work paper preparation may be reduced in an electronic environment.

Finally, as shown in Table 9, IT specialists are used more frequently and to a larger extent by Big 4 auditors as compared with non-Big 4 auditors. In addition, the frequency and extent of IT specialist use by auditors from national firms is more likely to be similar to auditors from smaller rather than Big 4 firms. A likely explanation for the firm size findings is that Big 4 firms are more likely to have clients with greater IT complexity than are non-Big 4 firms. In fact, respondent firm size is highly positively correlated ( $r = 0.37$ ;  $p < 0.01$ ) with the degree of client IT complexity and cross tabulation results shown in Table 9, Panels B and C, suggesting that the frequency of IT specialist use is lower when auditors from Big 4 firms examine clients with low IT complexity.<sup>11</sup> This relation between frequency of IT specialist use and client IT complexity does not hold for respondents from non-Big 4 firms.<sup>12</sup>

<sup>11</sup> As expected, the mean client IT complexity rating for Big 4 respondents (5.31) was significantly higher than the mean client IT complexity rating for non-Big 4 respondents (4.31).

<sup>12</sup> Pearson correlation and cross tabulation results also suggest that the *extent* of IT specialist use is lower when auditors from Big 4 firms examine clients with low IT complexity (Chi-square = 9.58;  $p = 0.002$ ). The relation between *extent* of IT specialist use and client IT complexity does not hold for respondents from non-Big 4 firms (Chi-square = 2.22;  $p = 0.14$ ).

**TABLE 9**  
**The Association of Firm Size with Frequency/Use IT Specialists**

**Panel A: Means and ANCOVA Results**

|  | <u>Big 4</u> | <u>National</u> | <u>Regional</u> | <u>Local</u> | <u>ANCOVA Results</u> | <u>Bootstrap Analysis</u>            |
|--|--------------|-----------------|-----------------|--------------|-----------------------|--------------------------------------|
| Frequency of IT Specialist Use Over Past Year <sup>a</sup> | 59.33        | 13.74           | 19.04           | 3.45         | **c                   | **A <sup>d</sup><br>**B <sup>d</sup> |
| Extent of IT Specialist Use <sup>b</sup>                   | 4.75         | 1.94            | 2.42            | 1.22         | **c                   | **A <sup>d</sup><br>**B <sup>d</sup> |

|  | <u>High Client IT Complexity n<sup>e</sup></u> | <u>Low Client IT Complexity n<sup>e</sup></u> |
|--|--|---|
|--|--|---|

**Panel B: Frequency of IT Specialist Use Cross-Tabulated with Client IT Complexity for Big 4 Firms**

|   |    |   |
|---|----|---|
| High Frequency of IT Specialist Use Over Past Year <sup>f</sup> | 35 | 7 |
| Low Frequency of IT Specialist Use Over Past Year               | 5  | 6 |
| Chi-Square = 6.76; p = 0.01                                     |    |   |

**Panel C: Frequency of IT Specialist Use Cross-Tabulated with Client IT Complexity for non-Big 4 Firms**

|   |    |    |
|---|----|----|
| High Frequency of IT Specialist Use Over Past Year <sup>f</sup> | 11 | 7  |
| Low Frequency of IT Specialist Use Over Past Year               | 39 | 62 |
| Chi-Square = 3.18; p = 0.07                                     |    |    |

<sup>a</sup> Participants estimated how frequently (0 to 100 percent) an IT specialist was used during audit engagements over the past year.

<sup>b</sup> Participants rated "the extent of use for each audit application on a typical audit" using a scale where 1 = none and 7 = extensive.

<sup>c</sup> ANCOVA results indicate that experience and firm size are both significant at  $p \leq 0.01$  level.

<sup>d</sup> Bootstrap analysis finds that frequency/use ratings differ based on (A) differences between Big 4 and non-Big 4 firms, and (B) differences between Big 4 and national firms where \*\* indicates  $p \leq 0.01$ .

<sup>e</sup> Client IT complexity is split at the mean of 4.63 on a scale of 1 = manual processing to 7 = highly computerized financial reporting system.

<sup>f</sup> Frequency of IT specialist use is split at the mean of 2.59 using a scale of 1 = none to 7 = extensively.

### CONCLUSIONS, IMPLICATIONS, AND FUTURE RESEARCH

Although IT has significantly changed the audit process, few studies have examined IT use across a diverse group of audit firms. Our descriptive study fills this void by examining audit IT use and perceived importance in the current audit environment across Big 4, national, regional, and local firms. Results indicate that some audit applications are used extensively (e.g., analytical procedures, audit report writing, electronic work papers, Internet search tools, and sampling), but others are not (e.g., digital analysis, expert systems, test of online transactions, database modeling, and continuous transaction monitoring). In addition, auditors indicated that several audit applications were important, although not used extensively (e.g., audit planning, client acceptance, client relationship management, fraud review, internal control evaluation, and risk assessment). Thus, practitioners may want to consider expanding their use of IT to include these applications. IT specialists do not appear to be used extensively in a typical audit, even by auditors who examine clients with complex IT.



Our findings also suggest that IT use and perceived importance varies by firm size. In general, auditors employed by Big 4 firms are more likely to use audit applications and rate their importance higher than auditors from non-Big 4 firms for several applications, including audit planning, electronic work papers, internal control evaluation, and sampling. Similarly, auditors from Big 4 firms are more likely to use email and telephone work paper review methods and to rely on IT specialists. These findings are consistent with the Big 4 firms having “deep pockets” that enable them to (1) purchase and implement superior IT, and (2) use IT specialists to a greater extent than non-Big 4 firms. Big 4 firms’ use of IT may also be a reflection of having clients with correspondingly greater IT complexity. Furthermore, auditors employed by national firms are more likely to use and assign perceived importance ratings similar to auditors from Big 4 firms on certain audit applications, such as fraud review, expert systems, and internal control evaluation, but are more similar to auditors from smaller firms on other applications such as audit report writing. It appears that national firms may be investing their IT resources in relatively high-risk areas such as fraud. Future research could investigate whether the IT use of national firms becomes increasingly similar to Big 4 firms over time, as they continue to acquire more SEC clients with sophisticated internal control systems.

Our study is subject to certain limitations. First, because of data availability limitations, we use auditor IT use and perceived importance to proxy for audit firm IT adoption. Obtaining audit firm level IT investment information would improve the extent to which our results can be generalized to practice. Second, Boritz (2002) discussed the use of IT by internal auditors. Our study did not address the issue of IT use by internal auditors in its relationship with external auditors. We reasoned that this would be difficult to assess and would be better addressed as a more focused follow-up study to our more general study. Third, our pilot tests indicated that choosing a single audit scenario or asking participants to select a specific audit in which to apply IT assessments would not provide informative data. Instead, pilot testing suggested that asking participants to assess IT use and importance for a typical audit provides a more clean and useful data set. While we used this context in our study, we realize that auditors from different backgrounds and firms may have different mental images of what a typical audit would be. It is hoped that our firm size analysis has captured any apparent differences in this regard. Fourth, our respondents did not identify whether audit application and productivity tool use was mandatory or voluntary. Prior IT usage research generally examines voluntary use contexts. Venkatesh et al. (2003, 13) caution that voluntary use results may not generalize to mandatory use settings. Additional research could investigate whether our findings differ in voluntary versus mandatory use settings. However, Fischer (1996) cautioned that making IT use mandatory may still not translate into auditors getting the full benefits of the technology, and that audit approaches differ substantially across and even within audit teams at the same firm.

Notwithstanding these limitations, our results provide important insights for standard setters, researchers, and practitioners into how audit firms currently use IT. Recent standards and congressional legislation have encouraged audit firms to adopt IT (PCAOB 2004a; AICPA 2006). For instance, SOX tightened internal control and financial reporting requirements (Winters 2004). This has led practitioners to propose that auditors and audit firms adopt internal control documentation IT (Winters 2004). Our results indicate that although auditors perceive internal control evaluation IT as important, fewer auditors than expected have adopted internal control evaluation IT.

Our results identify related research opportunities; future research could determine the extent to which auditors and audit firms plan to adopt internal control documentation IT to

address SOX issues. Furthermore, standard setters have raised concerns about the lack of communication between computer auditors and general auditors (Carmichael 2004, 132). Our results on the use of IT specialists suggest that these concerns may be well founded. Alternatively, these findings may reflect an increase in IT knowledge among respondents, thus lowering the need for IT specialists. Future research could examine factors impacting current and future IT specialist use.

In addition, IT use may be a significant barrier to entry within public accounting. In fact, the Public Oversight Board has suggested that the AICPA develop tools to help smaller firms with client acceptance issues (POB 2000), and the General Accounting Office (GAO) is examining barriers to entry within public accounting (GAO 2003). Consistent with prior research on the relationship between firm size and audit quality (Blokdijk et al. 2006), our findings suggest that the "deep pockets" of the Big 4 firms differentiate them from smaller firms in terms of their use of IT, potentially resulting in higher quality audits. However, the use of technology for work paper review by Big 4 firms may be of concern, since auditors' feelings of accountability may be reduced in an electronic work environment (Brazel et al. 2004). Finally, in terms of the national firms, it appears that they straddle the Big 4 and smaller CPA firms in terms of IT use, and may focus their IT investments in high-risk areas such as fraud.

With the increase in IT in auditing, identifying specific IT auditors are using may be useful for future judgment and decision-making research. For instance, our findings suggest that auditors employ IT when performing analytical procedures. This suggests that audit researchers should examine analytical procedures in an IT context. Conversely, our study found that IT was not used extensively for other audit applications such as digital analysis. Thus, future research attention should be directed to understanding the lack of IT use as opposed to how using these applications may impact the research task. Moreover, IT varies in complexity from simple or deterministic aids to decision support systems to expert systems (Messier 1995, 215). Researchers often classify IT by the complexity of the task (structured, semi-structured, and unstructured) and the decision-making activities (information acquisition, information evaluation, and action/choice) required for that complexity (Abdolmohammadi 1999; Messier and Hansen 1987). For parsimony, we did not ask participants to rate specific IT applications by complexity or to indicate what decision-making activities each IT application is used in. Future research could examine how complexity and/or decision-making activities impact audit IT use. Furthermore, IT use may be driven by individual or organizational pressures. Thus, future research could explore whether auditor IT use is driven by firm policy or individual auditor choice.

Finally, our study allows practitioners to compare their current IT practices with perceived IT use by auditors employed by firms of similar (or different) sizes. Practitioners may find this information useful as they consider how to allocate resources over various types of IT investments, and as they choose the IT investments that will help them remain competitive.

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