The Implications of IT Environment on the Audit and Financial Reporting Quality

Abstract:

This study explores the impact IT complexity and IT control deficiencies have on the audit and financial reporting. We create and validate a new theory-based measure of IT financial reporting complexity at the client level. Next, we quantify the cost of IT complexity and IT control deficiencies on audit effort. We find that, on average, an increase of one (out of 18) on the client's complexity score relates to an increase of 6% in IT audit hours. In comparison, the presence of an IT control deficiency relates to a 70% increase in IT audit hours. We further investigate and find that IT specialist experience partially mitigates the cost of IT complexity and IT control deficiencies, in particular, experienced IT managers and senior managers rather than experienced IT partners and directors. Finally, we find that experienced IT specialists are able to mitigate some but not all of the cost of IT complexity on financial reporting reliability. Overall, our results provide some of the first insight into complex IT environments' costs over financial reporting and highlights the importance of staffing decisions at the manager level.

1. Introduction

This study investigates how client's information technology (IT) used in the financial reporting process affects the audit and financial reporting. That is, we quantify the complexity of the client's IT environment[1] and examine the impact of our complexity measure on audit effort and financial reporting reliability, as well as the potentially offsetting effect that IT audit experience plays. We use two measures of a public company's IT environment: (1) the complexity of IT components in the financial reporting process and (2) IT-related control deficiencies. We investigate whether IT auditor experience mitigates the cost of IT complexity and control deficiencies across different positions of the IT auditor, bringing new insight to the importance of staffing decisions in the wake of complex IT environments.

The analysis is essential and timely, given the increase in the use of technology in the financial reporting process by public companies. The use of technology in the financial reporting process is important to the audit process as external auditors must navigate the complexities of the client's technological environment to perform a quality audit. While important to the audit practice, archival evidence on how the IT environment relates to auditing and financial reporting remains scarce, primarily due to a lack of available data. Most literature on technology and the financial reporting process is restricted to experimental methodology, finding that there is a cost and benefit to the implementation of technology (e.g., Brazel and Deng 2008). Likewise, there is limited research on how the client IT environment impacts the audit engagement team. Experimental studies have found evidence that IT auditor's risk assessments are modified in the wake of technological implementation (Brazel and Agoglia 2007). Our analysis helps open the

[1] The term IT environment encompasses various aspects of a company's operations. For purposes of this paper, we define an IT environment as an integrated collection of technology components which facilitate the financial reporting process.

black box on technology usage by public companies as we are the first study to our knowledge to quantify the complexity IT environment related to the financial reporting process in an archival research setting and assess the impact on financial reporting reliability.

To test our hypothesis, we obtained proprietary data from the Public Company Accounting Oversight Board (PCAOB). The information used in this study is submitted to the PCAOB prior to the inspection and is composed of inspections of the eight largest auditors in the U.S. We combine this data with publicly available data from Compustat and Audit Analytics. Our final sample is composed of 2,123 engagements inspected by the PCAOB between 2009 and 2017. Our analysis is restricted to inspected engagements and not a randomly chosen sample. Due to these limitations, the results of the study may not generalize to a full population. Nevertheless, our analysis is at least applicable to riskier audits, where the effect of these characteristics on the audit process might be greater (Hanson 2012; Peecher and Solomon 2014).

Using proprietary data from the PCAOB, we develop a novel measure to capture IT complexity in the financial reporting process. To create this measure, we use questionnaire responses from auditors about their client's IT environment. This data details the number of applications, modifications and new technology, server locations, and end-user access used by the client in the financial reporting process. We incorporate this information following the theory on IT sophistication over financial reporting developed by Singleton (2010) to generate an IT complexity score for each company in our sample. We validate this measure by finding a higher propensity for auditors to identify ITCD[2] during the audit and IT related irregularities (whether a cyber-attack, fraud, or IT outage occurred at the client) in clients with more complex IT environments.

[2] We use the term ITCD in this paper as a deficiency in Information Technology General Control deficiency (ITGC).

Our first set of analyses examines the effect IT complexity and IT control deficiency (ITCD) has on the auditor effort. We examine the impact our complexity measure and IT control deficiencies have on three measures of audit effort, IT audit hours, substantive audit hours, and audit fees. We find that clients with more complex IT environments are associated with more audit effort. On average, an increase of one (out of 18) on the client's complexity score relates to an increase of 6% in IT audit hours. When we disaggregate our complexity measure, we find that the number of applications, the implementation of a modification or new technology in the current year, and end-user access are associated with more audit effort. We also find that, on average, a client with at least one ITCD is associated with a 70% increase in IT audit hours. However, the cost of ITCD is not passed on to the client as audit fees are not affected. Together these results indicate that complex IT environments are associated with more audit effort.

Our subsequent analyses examine if experienced IT auditors can mitigate the negative effects of a complex IT environment. We distinguish between the IT auditor's client-specific, industry, and role experience across the position they hold on the engagement (i.e., partner, executive director, senior manager, or manager). Our findings indicate that experienced IT auditors spend less effort auditing a client with a complex IT environment, including an ITCD, relative to less experienced auditors. More specifically, we find that audits using more experienced senior managers/managers are more efficient in auditing complex IT environments and clients with ITCD, as evident by fewer overall IT auditor hours. However, the benefits of experience only partially offset the overall cost of a complex IT environment.

Additionally, we find that the use of experienced IT auditors impacts the substantive audit effort and reliability of the financial statements. We find that audit engagements where clients have an ITCD but are staffed with more experienced IT managers/senior managers are

associated with fewer substantive audit hours. While more complex IT environments are associated with a higher propensity to restate, we also find the presence of more experienced IT managers/senior managers offset some of the reliability costs.

Our study contributes to the literature on auditor experience. Prior literature finds that substantive auditor experience increases audit quality and auditor efficiency (e.g., Aobdia, Choudhary, Newberger 2020). We extend this literature by examining the IT specialist[3] experience and their impact on the audit engagement. Unlike Aobdia, Choudhary, Newberger 2020, who study the varying roles of substantive auditors on audit quality, we identify specific engagement characteristics which may complicate the audit (IT complexity and ITCD's) and evaluate whether they can be mitigated by experienced IT auditors and whether the experience effects differ across positions.

Our study also contributes to the literature by quantifying the costs of complex IT environments on the audit, and financial reporting quality, particularly by investigating lower-level IT control deficiencies. Prior literature primarily focuses on IT material weakness and its impact on financial reporting quality (e.g., Li et al. 2012). We are the first to utilize ITCD's identified by the auditor in a fiscal year. This measure of ITCD's include all IT-related deficiencies that do not require public disclosure. This measure differentiates our study from prior literature as we are able to examine how all ITCD's impact audit effort and financial reporting quality, not just material weakness.

Together the results suggest of this study that, at least in the U.S., IT complexity and ITCD's should be considered when studying audit efficiency and financial reporting quality. Our

[3] We use the term specialist here to distinguish the audit team members that focus on the information technology component of the audit. The current PCAOB audit standards for using the work of specialists exclude persons with specialized skill or knowledge in IT from the definition of a "specialist.".

results also indicate that audit practitioners should consider the experience of IT auditors when staffing engagements not only to increase efficiency but also to improve financial reporting reliability, and specifically at the manager/senior manager level. We caution the reader that the analysis in this study is based on a sample of engagements inspected by the PCAOB. The selection process of the PCAOB is not entirely random. Therefore, it is not certain that the results of this study are generalizable to non-PCAOB inspected engagements. We encourage academic researchers to explore research in this area to determine whether the results of this study are generalizable to different samples, regulatory regimes, and countries.

The remainder of this paper is structured as follows. Section 2 includes reviewing prior literature and developing the main hypotheses; Section 3 describes the data and the sample construction; Section 4, the empirical tests and results. Section 5 concludes.

2. Background

2.1 Authoritative Guidance

As technology solutions continue to evolve for audit clients, audit standards have changed to combat these advancements. Over the last two decades, auditing standards that pertain to information technology (IT) have evolved substantially with an increased focus on the role IT plays in internal controls over financial reporting. The AICPA passed SAS 94: The effect of information technology on the auditor's consideration of internal control in a financial statement audit, effective June 2001, to revise SAS No. 55: Consideration of internal control in a financial statement audit. Some changes include requiring auditors to document how IT may affect internal controls and control risk (Ratcliffe and Munter 2002). This new standard required auditors to expand their documentation of system controls from simple checklists to flow charts, decision tables, questionnaires, and specialized IT skills as part of the assurance process. SAS 94

also details specific risks to internal control over financial reporting posed by technology, such as inaccurate data processes, unauthorized access, inappropriate manual intervention, and data loss. Hence, the auditor has expanded the focus on how information systems can contribute to misstatements.

Auditors further expanded their focus on internal controls under the Sarbanes Oxley Act of 2002, subsequent to which the AICPA and IAASB issued eight auditing standards related to risk assessment (SAS 104 - SAS 111), effective December 15, 2006. These changes include (but are not limited to): defining different levels of control deficiency severity and their evaluation, enhanced communication of control deficiencies with the board of directors and management, establishing a more in-depth understanding of the control environments and risks, and better linking the latter to auditing procedures. There was also an expanded focus on risks that arise from IT, in particular new technology, personnel, or changes in the operating environment (SAS 109 para 77). SAS 109 also requires the auditor to evaluate not only a specific control activity but the combination of control activities to understand whether they can prevent, detect, and correct material misstatements (SAS 109 para 91). The latter highlights the need to investigate information technology effects, not in isolation, but in combination with manual and other activities used to process financial data.[4]

The PCAOB, which establishes and amends the auditing, quality control, ethics, independence, and other standards relating to the preparation of audit reports of public issuers beginning in 2004, further enhanced the auditors' focus on internal controls and IT through

[4] SAS 94 was subsequently incorporated into AU 319 by the AICPA and adopted by the PCAOB as part of its interim auditing standards in 2003. SAS 09 and 110, which were subsequently adopted by the AIPCA, were incorporated into AU 314 and 318 and taken into account by the PCAOB prior to the PCAOB's adoption of AS 2110 and AS 2301 in 2010. AU 319 and then AS 2110 and 2301 are applicable during our sample period for public company auidts.

auditing standards AS 2110 and AS 2301. These standards require auditors to *assess* a client's internal controls' adequacy, not merely document an understanding of them (Taliaferro and Nugent 2010).

Overall, some technology risks discussed in authoritative guidance relate specifically to internal controls over financial reporting, such as manual intervention, unauthorized changes to the system or data, and unauthorized access. Beyond internal controls, auditors also focus on risk assessment in general, and therefore must also understand how a client's use of technology generates an additional risk of misstatement. Risks other than those related to internal controls include (but are not limited to): inaccurate data, incomplete data (i.e., data loss), the inability of multiple systems to transfer data properly, cybersecurity risks, and risks using third-party service providers. Auditors now dedicate significant resources and develop skills to assess the role technology plays in financial reporting.

2.2 Literature Review

In cases where the client relies heavily on accounting information systems (AIS) to process financial information, a substantive audit alone is not only insufficient per authoritative guidance but also may be inefficient at reducing detection risk to acceptable levels. The assurance process requires auditors to understand all the automated and manual procedures and controls used to prepare financial statements (Tucker, 2001). Accordingly, in our sample, every engagement has IT auditors in addition to the core (or substantive) audit team as part of the assurance process. The IT auditor's primary role is to support financial statement auditors by assessing the reliability of the system controls that address IT-related risks of processing financial data (e.g., ISA 315, Daigle 2005, Sayana 2002). Bauer and Estep (2020) suggest that the relationship between IT auditors and financial auditors can improve the ability of the

substantive auditor reliance on IT auditors' work. As clients continue to rely more heavily on technology in the financial reporting process and as the complexity of AIS continues to increase, the role the IT auditor plays in the overall assurance process also increases.

Following this emphasis on AIS controls, prior research documents important links between AIS and the financial reporting process via internal controls. For example, Messier, Eilifsen, and Austen (2004) use a small sample survey approach in Norway to find a significant cause of misstatements are a poor design of controls for computerized business processes. Li et al. (2012) builds on this notion and establish a link between internal control material weaknesses in AIS and the quality of the information produced by the AIS, as evidenced by lower earnings forecast accuracy. Both echo general research findings that link internal control quality, not specific to IT (e.g., Abbott, Daugherty, Parker, and Peters 2016), to financial reporting reliability. We extend this research by looking at lower level-IT control deficiencies (defined as those less severe than a material weakness) and their association with audit cost and financial reporting reliability.

While limited possibly due to data accessibility, another branch of prior research in AIS investigates the link between IT complexity and financial reporting reliability. Brazel and Dang (2008) study the impact of IT complexity through clients that implement a new ERP system. They find that new ERP implementation is associated with greater propensities to manage earnings (a cost) as well as earlier release of financial information (a benefit). We extend this research in two ways. First, we establish the cost of IT complexity to the audit (in terms of hours fees and profitability), not just financial reporting reliability. That is, we quantify additional costs of IT complexity. Second, we consider various aspects that comprise IT complexity beyond changes or modifications to AIS (which relates to new system implementation studied by Brazel

and Dang 2008). We capture complexity in terms of application count and level of customization, and distributed data processing (DDP; Hall 2015). DDP captures the extent to which financial data is not processed in a centralized manner. We measure the extent of DDP using server locations, decentralization, and end-user access. Finally, we study the implication of IT complexity for financial reporting quality, an extension Brazel and Dang (2008) that establishes an association with earnings management, which requires incentives but does not capture all aspects of financial reporting quality.

Our work also contributes to a second strand of prior research that establishes a link between experience and auditing complexity. Several experimental papers find evidence that audit experience plays an essential factor in improving audit judgment when tasks are more complex or less structured, for example, semi-structured and unstructured audit tasks in (e.g., Abdolmohammadi and Wright 1987), forecasting error frequencies and magnitudes (e.g., Libby and Frederick 1990; Tan, Ng, Mak 2002), estimating client's willingness to take inventory write-downs (e.g., Trotman, Wright, and Wright 2009). Specific to IT, Brazel and Agoglia (2007) perform an experiment and find that IT expertise affects auditor control risk assessments. We extend this research in several ways. First, we build on Brazel and Agoglia (2007)'s analyses. They find evidence that IT expertise changes risk assessment and testing decisions. We extend this to studying the impact to financial reporting quality, measured via ex-post restatements, which allows us to evaluate the correctness of the judgments, not just whether the judgments differ. We further extend their analysis in our evaluation of outcomes using costs which allows us to provide estimated economic costs in terms of hours and fees from actual audits. Second, we evaluate whether IT expertise may offset the costs of IT control deficiencies or IT complexity in a broad sample of audits. Finally, we extend Brazel and Dang (2007) by measuring IT expertise

across different roles on the audit team (e.g., partners and directors versus managers and senior managers) to evaluate whether different roles on the IT audit team have a different impact on reporting quality.

Our study is related to but distinct from Aobdia et al. 2020, which finds that more time spent by experienced audit team members (other than the lead partner) are associated with better audit quality or lower restatement propensity. Their focus is on the audit team; their analyses exclude the IT and tax specialist auditors. Their analysis may not translate to the IT audit function as the IT auditors do not typically have a lead partner whose primary focus is building and maintaining client relationships,[5] and the IT members are not subject to mandatory rotation. Additionally, IT auditors are focused on the IT-related procedures of the audit. Unlike substantive auditors, the IT auditor generally is not responsible for certain planning procedures such as scope and materiality determination. Therefore, the IT auditors' impact on the engagement is mostly restricted to fieldwork as opposed to the substantive auditor who impacts all aspects of the audit. Secondly, we investigate whether IT expertise can offset the costs of control deficiencies and complexity, which allows us to explore the relationship between experience and difficulty of the audit, expanding our understanding of the importance of IT audit staffing.

3. Hypothesis:

Prior literature documents how the complexity of client's business impact the generation and auditing of financial reporting. Hackenbrack and Knechel (1997) find that the more complex the client, the more difficult and time-consuming the audit. As a result of this complexity, the auditor will allocate more resources to complex engagements. The allocation of these resources,

[5] Given auditors are able to sell very limited non-audit services to clients, the IT partners and directors may be more focused on managing the audit relative to lead partners.

including labor inputs, result in higher fees (Simunic 1980). However, these studies are restricted to using measures for business and industry complexity. We expand this notion of complexity to IT. We consider IT complexity to increase with decentralized information systems, distributed data processing, greater customization to applications that process financial data, more locations of data centers, changes to technology systems, and more end-user access (see section 3.2 for expanded discussion). Hence, we expect a more complex IT environment over financial reporting requires the IT auditor to expand their documentation, procedures, and assessments resulting in more effort.

Similarly, we expect that identified IT control deficiencies require the IT auditor to expand their analysis of the control systems. When a control deficiency is identified, the IT audit team communicate the issue to the substantive audit team. The severity of the control deficiencies and the impact on financial reporting must be evaluated by the audit team, who also must adjust audit procedures accordingly. The additional steps IT auditors perform related to identification of IT control deficiencies require communication with the client and substantive audit team, as well as expanded assessments of internal controls.

What is less clear is whether complexity or control deficiencies would not only require expanded effort by the IT auditor but also more effort by the substantive auditor. It is possible that greater IT complexity or the existence of control deficiencies may result in more substantive testing as the output of more systems may need to be tested using substantive procedures. Accordingly, we predict the relation between IT complexity (IT control deficiencies) and audit effort for both the IT auditor and the substantive auditor could increase. On the other hand, the substantive audit may not be affected due to the expanded work by the IT auditor. Assuming there is no material control deficiency, this may give the substantive audit team greater reliance

on the controls leading to a reduction of substantive testing with analytical or other testing procedures. Hence, the expanded IT audit work to address complexity may compensate for any additional work the substantive auditor would do. In the case of IT control deficiencies, as these are lower-level deficiencies that do not rise to the level of a material weakness, it is possible the substantive auditor will not pay much attention to them. We state our first hypothesis in the null form as follows:

H1: IT complexity is (IT control deficiencies are) unrelated to audit effort.

Next, we further evaluate whether experienced IT audit personnel can mitigate the effects of a complex IT environment or IT control deficiencies. Abdolmuhammadi et al. (1987) identify that experience is required to perform an unstructured audit task adequately, where unstructured tasks are those that are unique with few guidelines that require judgment and insight to define the problem (Simon 1960). We argue that assessing a client's IT system over financial reporting is a largely unstructured task as every client will be unique. Even if clients use similar applications, personnel, assigned duties, controls, and application of controls will differ. Further, as the complexity of the IT environment increases, so will the judgment and insight that would be required to evaluate and assess its operating effectiveness. Similarly, evaluating the implication of a defective IT control is an idiosyncratic process as every client will have different IT control systems in place and different implications based on how their IT systems interact with each other and manual processes. As the experience of the IT auditor increases, the auditor may be able to execute the complex task more efficiently because they can better identify effective audit procedures and evaluate their outcomes better. In addition, experienced IT auditors have more knowledge from prior engagements, which they can apply to their current engagements. The latter is consistent with prior research that finds that more auditor experience is associated with

improvements in audit efficiency (Che, Langli, and Svanstrom 2018). Accordingly, we predict that more experienced IT auditors will spend fewer hours auditing an issuer's complex environment, as follows:

H2a: When auditing complex IT environments (clients with IT control deficiencies), more experienced IT auditors require less effort.

The impact of experienced IT auditors may not be restricted to IT audit efforts. With more experience, the IT auditor may be more efficient and thorough in its evaluation of IT controls, which in turn might require less effort by the substantive audit to review the IT auditor's work. Additionally, an experienced IT auditor may be able to identify a control deficiency earlier in the audit process. Early identification could allow the client to remediate the control allowing the substantive auditor to rely on the IT controls by identifying a compensating controls instead of identifying, testing, and mitigating non-IT controls, resulting in fewer hours charged by the substantive audit team.[6] As such, the substantive auditor will also require fewer hours to audit a company with a complex IT environment.

We also separate our analysis by experience within the team member role. We identify whether a team member is a partner, director, senior manager, or manager. We utilize this information to evaluate whether IT auditors that are partners or directors have more or less impact on efficiency relative to senior managers and managers. While the lead partner for the overall audit oversees the entire audit, the IT audit work is conducted by a mix of partners/directors, senior managers, managers, and lower-level IT audit staff. On the one hand, the IT staff will likely report to the IT partner or director on the client who has oversight roles in

[6] Information on ITCD's are collected by the PCAOB. The PCAOB asks the audit engagement team to identify if there has been an IT control deficiency during the year whether or not it was remediated by year end. Therefore, our measure of ITCD captures both remediated and unremediated ITCD.

planning and executing the IT audit as well as serving as an important intermediary between the IT audit function and the substantive audit function. This would suggest their experience and expertise would impact the IT audit planning and execution which varies with IT complexity and the existence of control deficiencies. Alternatively, interviews with Big 4 partners suggest much of the day-to-day management and expertise resides with senior managers and managers (e.g., Carter and Spence 2014; Westermann et al. 2015). Anecdotal discussions with IT partners indicate they focus more time on winning audit and consulting work rather than managing day-to-day activities relative to other IT personnel. Thus, it is unknown whether any efficiency from IT audit experience will vary across the role of the IT auditor, leading to the following hypothesis stated in the null:

H2b: The impact IT audit experience of audit professionals has on efficiency does not vary across the role.

Next, we turn to the potential impact that IT complexity and IT control deficiencies have on financial reporting reliability. While the use of technology to process financial data can improve the reliability and/or speed of producing financial reports, it also introduces several possible risks. As the complexity of the IT environment increases, so does the need to have reliable internal controls and greater assurance over the IT environment. For example, the likelihood of processing inaccurate data or the possibility the auditor does not sufficiently understand how all the systems interact increases with complexity, in turn, increasing the possibility of errors. In more complex IT environments, the auditor may have difficulty determining the existence and severity of IT control deficiencies. IT systems generate the reports used by auditors for sample selection. As the IT environment becomes more complex or has deficiencies, there is more potential for errors to occur in the generation of the reports and/or

selection of the sample, specifically an increasing possibility that the selected sample for assurance may not be representative. Additionally, as complexity and deficiencies increase, there could be a higher likelihood of scoping issues. These audit scoping issues may involve the inability of the auditor to evaluate all necessary financial processes, applications or locations. Finally, as complexity and deficiencies increase, there could be more opportunities to manage earnings.

These examples are consistent with prior research that finds that financial reporting systems have an impact on financial reporting and auditing. Brazel and Dang (2008) find that as a result of the Enterprise Resource Planning (ERP) integration implementation, earnings management increases, but earnings are released in a more timely fashion. Their results are consistent with the ERP systems increasing manager access, allowing for more considerable discretion over accounting information, leading to enhanced opportunities to manage earnings in ways that meet managers' objectives (e.g., beat earnings expectations). Prior research also indicates that there may be reductions in internal control effectiveness and audit quality in ERP implementations (Wright and Wright 2002; Hunton et al. 2004; Brazel and Agoglia 2007).

Alternatively, if engagements are appropriately staffed to address IT complexity and control deficiencies of a given client, then we may not observe any effect of either on financial reporting reliability in general. Additionally, if added or modified substantive audit procedures can adequately improve the level of assurance to counteract IT complexity and/or deficiencies, then we may not expect to see any impact of IT complexity on financial reporting reliability. This leads to our third hypothesis, stated in the null form:

H3a: IT complexity (IT control deficiency) is unassociated with financial reporting reliability.

We expand our analysis to incorporate the role of IT audit experience in addressing the client's complex IT environment, using similar reasoning of H1b but in reference to audit quality improvements rather than efficiency improvements. Prior research finds that individual partners can transfer knowledge from experience on prior engagements to current engagements to improve audit quality (Chin and Chi 2009; Chi and Chin 2011; Chen et al. 2017). As the auditor has more experience on their client, client's industry, or in the profession itself, they will be able to apply the expertise from their engagements to improve quality. We predict this effect will be more relevant or necessary when the IT system is more complex because more judgment and evaluation will be necessary in these cases to provide the same level of assurance. However, if the staff experience level needed matches the IT complexity for clients, then we will fail to find a cross-sectional association between IT complexity and IT audit experience on financial reporting reliability. Additionally, if substantive audit procedures can overcome IT complexity and are used appropriately when needed then we will not observe any cross-sectional relation between IT complexity and experience on financial reporting reliability. Using similar arguments to H1c, we also investigate whether the impact on audit quality differs across the role of the audit team. This leads to hypotheses 3b and c, stated in the null:

H3b: When auditing complex IT environments, more experienced IT auditors are positively associated with audit quality.

H3c: The impact IT audit experience of audit professionals has on financial reporting quality does not vary across the role.

3. Sample Data Construction and Measures of Engagement Characteristics

3.1 Data construction

Section 104 of SOX instructs the PCAOB to inspect individual engagements of public accounting firms that audit SEC-registered corporations. As part of these inspections, the

PCAOB collects information from audit engagements prior to inspection. This information contains a breakdown of the issuer's IT environment related to financial reporting, including the location, operating system, number of applications used in the financial reporting process, and whether the applications were developed in-house, purchased from a third party, or customized specific to the client. Additionally, as part of the inspection procedures, the PCAOB obtains information regarding whether the audit client has implemented new or modified technology in any part of the financial reporting process. The PCAOB documentation about IT relates to the year of inspection only. Information prior to inspection is not available. We also obtain proprietary data from PCAOB inspection documents about hours and experience used by Aobdia et al. (2021).

We obtain engagement characteristics data from the inspection documents that result from this process. To obtain permission to access these data, we submitted a research proposal to the PCAOB describing our study's nature, the data necessary to conduct this study, and a summary of related research and proposed research questions. As a condition of data access, the PCAOB reviewed our research to approve releasing non-public information. A joint effort was undertaken between PCAOB staff and us to extract inspection data into a usable database. The initial dataset encompasses 2,757 individual inspections for audit engagements inspected between 2009 and 2017 across the eight largest U.S. audit firms (Deloitte & Touche, Ernst & Young, PricewaterhouseCoopers, KPMG, BDO, Grant Thornton, Crowe, and RSM).

Out of the 2,757 inspection observations, we eliminate 453 observations where information on the IT environment over financial reporting was partially missing. Because we combine proprietary data on IT environment over financial reporting with proprietary data on audit hours and experience, we removed an additional 101 observations that were missing hours

data and five observations that were missing experience of team members' data. We combine the 2,198 remaining observations with additional PCAOB proprietary data about the outcome of the PCAOB inspection (i.e., whether a Part I Finding is identified or not), the engagement risk rating, etc. We also combine the PCAOB specific data with Compustat and Audit Analytics data to compute several dependent and control variables, such as audit fees and whether the fiscal year-end statements contain a restatement. We eliminate 74 observations where additional PCAOB, Compustat, or Audit Analytics data are missing. Because there was only one observation that had a material weakness related to IT, too small to separately analyze or distinguish, we removed it. Our final sample consists of 2,123 inspection observations (1,754 unique clients). Our analysis is primarily cross-sectional given the lack of time-series data availability. Table 1 summarizes the sample selection process.

(Insert Table 1 About Here)

Panel B of Table 1 reports the number of observations in the sample, partitioned by inspection year, and whether the auditor is a Big 4 firm. The number of observations in each inspection year increases over our sample period, where any given year comprises between 9-13% of the sample. The Big 4 observations comprise 69% over the overall sample, and between 65% and 75% of the annual number of observations in our sample.

3.2 IT Complexity and ITCDs

Singleton (2010) identifies a model of IT sophistication. The basic model breaks down the company's IT environment into various components: servers, network operating systems, workstations, applications, remote locations, ICFR, emerging/advancing technology, and online transactions. The PCAOB limits the data in their inspection questionnaire to only some of these components. The questionnaire documents the number of applications (*Applications*), server

locations (*Locations*), and binary (i.e., yes/no) answers to the following questions: whether processing of accounting data is centralized such that IT general control processes are the same (*Decentralized* equals one if yes),[7] whether there have been significant modifications to the accounting systems or whether there are any new technologies (e.g., hardware, software, or processes) introduced into the information system environment (*Modification* equals one if yes), and whether the organization relies on end-user applications to process data that is financially significant (*End User* equals one if yes).[8] Inspection documents also contain data about whether applications are purchased or built in-house. Hence our *IT Complexity* measure is based on these reported components. Inspection documentation does not report the number of servers, workstations, or online transactions. Thus it provides incomplete data about the conceptual notion of IT complexity.

(Insert Table 2 About Here)

Using the available data from inspection documents, we sort companies into 18 categories based on their IT environment to generate a score for *IT Complexity* (see Appendix B for methodology), where higher scores indicate more complex IT environments. Panel A of Table 2 presents the distribution of the *IT Complexity* score. A low (high) score represents less (more) IT complexity in financial reporting. Each of the 18 numerical scores contains 3% to 10% of our sample, and scores one through nine comprise 49% of our sample.

Panel B of Table 2 presents the average *IT Complexity* score and the decomposition of the underlying components used to compute the score by year. Over time, the complexity of IT environments increases on average from 8.4 to 10.7, consistent with technological advancements

[7] Examples include whether change management, user access management, and IT operations vary across locations.
[8] Some examples of end user access include use of spreadsheets or database queries in financial reporting or to process data.

and reliance that tend to increase over time. When we look at the components of IT complexity, it appears the % of purchased applications, the number of applications, and the % of issuers with new technology increase over time, driving the increase in IT complexity overall. Alternatively, end-user access and location counts appear to remain relatively steady over our sample period. The overall mean of *IT Complexity* is 9.33, reported in Table 3.

We also use proprietary data from the PCAOB about the existence of IT control deficiencies (*ITCD*), which do not rise to the level of a material weakness. The PCAOB obtains information on IT control deficiencies as a part of their inspection procedures which includes a yes/no question about the existence of control deficiencies in the IT systems over financial reporting. None of the observations in our sample have an IT-related material weakness because we eliminated the one and only observation that had such a severe IT control deficiency. This indicates our measure *ITCD* captures the existence of one or more deficiencies in the IT environment but does not capture the number or severity.[9] Table 3 indicates that 81% of engagements in our sample reported an *ITCD* identified during the audit period inspected.

3.3 Construct validity

We test the validity of our internally constructed *IT Complexity* using associations between *IT Complexity* and two related outcomes. First, we believe that more complex IT environments are more likely to have IT-related control deficiencies. This is because more complex IT environments have more components that must interact, change, and transfer data increasing the need for additional control processes and procedures and increasing the possibility

[9] Aobdia, Choudhary, and Sadka (2020) obtains control deficiency counts and severity on a limited number of non-IT control procedures the PCAOB inspection documentation records. Their tabulated analysis uses indicators for the existence of control deficiencies based on severity, similar to our approach. They note results are consistent using counts incorporated as percentages of deficiencies relative to the number of control procedures, casting some doubt on measurement concerns.

of deficiencies in the controls. We illustrate the relation between *IT Complexity* and *ITCDs* by graphing the propensity of an *ITCD* by quintiles that range from low (quintile 1) to high *IT Complexity* (quintile 5) in Figure A. We find the propensity of *ITCDs* increases from 68.3% in the lowest *IT Complexity* category to a high of 90.3% in the quintile with the most complex IT environments, as predicted.[10]

(Insert Figure A and B about here)

We perform a second construct validity test by evaluating the relation between *IT Complexity* and *Irregularities*. An irregularity exists (i.e., a binary value set to one) if the client experienced a cyber-attack (i.e., any attacks perpetrated from the internet, external sources, or from within the entity that have compromised system security), a IT outage (i.e., extended outage of accounting systems where back-up systems or data were required to restore operations), or a fraud related to IT controls (a fraud perpetrated where the underlying cause is traced back to insufficient IT controls) during the fiscal year. We expect a more complex IT environment will result in higher instances of irregularities as there may be more points of entry for cyber-attacks, more systems that suffer from outages, and more opportunities to perpetrate fraud related to IT. This data is not always publicly disclosed; we rely instead on the inspection documents that inquire about this possibility. In our sample, there are 49 clients that had an *Irregularity*. We graph the propensity for an irregularity across each quintile of *IT Complexity,* ranging from low (quintile 1) to high (quintile 5).[11] The most complex quintile has more frequent *Irregularities* of 6.4 % relative to the lowest quintile of 0.67 %. Overall, we find evidence that corroborates our

[10] The correlation between *IT Complexity* and *ITCD* is 0.20 ($p < 0.01$). We perform multivariate analysis in OLS with *ITCD* as a dependent variable and our *IT Complexity* variable as our variable of interest, controlling for the same factors included in model (1) and find a positive and significant relation between *IT Complexity* and *ITCD* ($p < 0.01$).
[11] The correlation between *IT Complexity* and *Irregularity* is 11.48%. We perform multivariate analysis in OLS with *Irregularities* as a dependent variable and our *IT Complexity* variable as our variable of interest, controlling for the same factors included in model (1) and find a positive and significant relation between *IT Complexity* and *Irregularities* ($p < 0.01$).

measurement of *IT Complexity,* namely, both *ITCDs* and *Irregularities* are more common in more complex IT environments.

3.4 Additional Measures Used in our Analyses

(Insert Table 3 About Here)

We use three measures of audit effort to test H1 in our analyses, the natural log of: the hours charged to the engagement by the IT audit personnel (*IT Hours*), the hours charged to the engagement by the substantive audit personnel (*Substantive Hours*) from PCAOB proprietary data, and total audit fees (*Audit Fees*) from Audit Analytics. *IT Hours* represent the number of hours of audit work performed by the IT audit specialists on a given engagement year. *Substantive Hours* represent the hours performed by the core audit team, excluding hours incurred by IT, tax, or other specialists on an engagement. *Audit Fees* represent the fees the auditor receives on the whole engagement. We report the logged distributions in Table 3 and in our analysis. Untabulated analysis reports the unlogged average *IT Hours* are 965 hours or about 16% relative to average *Substantive Hours* of 5,958. Average fees are about $2.6 million for our sample.

We utilize PCAOB inspection data that report individuals' engagement team experience to compute several measures of IT auditor experience. The data includes the number of years IT specialists at the level of manager, senior manager, partner, or director have auditing the client (*IT Client Exp*), auditing the industry (*IT Industry Exp*), and auditing in their current position as a manager or senior manager (*IT Role Exp*). First, we report averages across all IT specialists at the level of manager and above. On average, we find our sample has 2.31 years of role experience, 8.37 years of client experience,[12] and 3.08 years of industry experience. We then separate the

[12] It is important to note that as a part of the Sarbanes- Oxley Act section 203, IT specialist partners do not have a requirement of mandatory rotation unlike lead engagement partners (17 C.F.R. § 210.2-01(c)(6)).

years of experience across roles, where '*partner'* experience includes both partners and directors, and '*mgr'* experience includes both senior managers and managers. In Table 3, we find that the average experience across role, industry, and client is lower for partners relative to managers.

4. Empirical Analyses

4.1 Research design

To test H1, we assess whether IT Complexity is associated with auditor effort using the following linear regression:

$$Audit\ Effort_{i,t} = \alpha + \beta_1\ IT\ Enviornment_{i,t} + \beta_2\ Proprietary\ Client\ Controls + \beta_3\ Auditor\ Controls_{i,t} + \beta_4\ Business\ Complexity_{i,t} + \sum \beta_k\ Fixed\ Effects_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where the subscripts *i* and *t* correspond to clients and years, respectively. We consider three measures of our dependent variable. We utilize the log transformation of hours reported by the IT auditor (*IT Hours*), hours charged by the substantive audit team (*Substantive Hours*), and the overall audit fees (*audit fees*) as defined previously. We use *IT Complexity* and *ITCD* as our measures of financial reporting IT environments, also defined previously. H1 predicts a positive coefficient for β_1, the relation between the IT environment and audit effort.

We control for a variety of factors in our analysis to ensure the relationships we study to capture the constructs of interest but are distinct from other characteristics that might be related to IT complexity and/or IT control deficiencies. First, we include a set of proprietary PCAOB control variables that capture unique client characteristics. Because auditor assessments of client risk can affect auditor effort, staffing decisions or procedures, client acceptance/continuance, and audit failure (e.g., Hackenbrack and Knechel 1997; Bell et al. 2001; Johnstone and Bedard 2003, 2004; Bedard and Johnstone 2004), we control for risk rating (R*isk Rating*). We obtain the specific risk rating for each engagement from PCAOB inspection documentation and standardize them by year and audit firm. The IT auditors' reliance on internal audit work may curb audit

hours and impact audit quality. Therefore, we control for the use of internal audit in the testing of IT controls by including a binary variable (*Internal Audit*) if the IT auditor relied on internal audit work in completing its testing of IT general controls. Over a fiscal year, management of a control process may change, or companies could go through a reorganization. These changing environments can impact the function of controls or modify complexity beyond IT systems. To capture the effect, we include an indicator variable taking the value of one if any process[13] has changed (C*hange Mgt*) and an indicator variable it the company has undergone a significant reorganization (*Reorg*) in the current year, [14] zero otherwise. Finally, Aobdia (2019) finds that audit quality impacts the likelihood of audit failure, so we control for the log of the number of part 1 findings (*Part 1 Findings*). Part 1 Findings capture inspector judgments that the engagement team did not perform sufficient audit work to support the audit opinion according to auditing standards.

Following prior literature (e.g., Francis et al. 2005, Francis and Yu 2009, Reichelt and Wang 2010, DeAngelo 1981; Bell et al. 2015; Aobdia 2019), we include control variables that measure auditor characteristics that have been shown to influence audit effort or fees. We also control for audit quality using the market share of the auditor's office (A*udit Mkt Share*), total client assets for the auditor's office (A*udit Office Size*), the ratio of the clients' audit fees compared to the audit fees of the audit office (C*lient Importance*), and (*First Audit*) if the auditor is in their first year of auditing the client.

[13] A change in process may include if there has been high or unusual turnover in IS management or any area of the organization.
[14] A reorganization includes business process improvement measures, merger or acquisition activities, or development of major new lines of business or locations.

We include various controls for the client's business complexity that prior literature finds could be associated with audit effort or quality (e.g., Simunic 1980; Hackenbrack and Knechel 1997; Francis et al. 2005; Francis and Yu 2009; Reichelt and Wang 2010; Aobdia et al. 2021). To control for the size and innate complexity of the client, we include the log of assets (*Size*) and the combined number of business and geographic segments (*Segments*), percent of foreign operations income (*Foreign*), natural log of company age (*Age*), if the company is a multinational organization (*Multinational*), and if a merger over 25% of the company has occurred in the current year (*Merger*). We also control for client losses *(Loss)*, book to market (*BTM*), sales growth (*Growth*), litigation risk (*Litigation risk*), return on assets (*ROA*), restructuring (*Restructure*), non-IT material weakness (*MW*), and accelerated filing status (*Accel Filer*). Detailed variable definitions are provided in Appendix A. Model (1) is estimated using ordinary least squares (OLS). We also incorporate year, audit firm, and Fama French 12 industry fixed effects, cluster standard errors at the client level, and winsorize all continuous variables at the 1st and 99th percentiles to limit the influence of outliers in the specifications.

To test H2a regarding whether experience offsets audit effort, we add a variable for the average experience of the IT team at the manager level or above to model (1). We distinguish three types of experience: role (*IT Role Exp*), client (*IT Client Exp*), and industry (*IT Industry Exp*) as the average number of years of experience of each type across the manager level and above among IT specialists. We also interact each measure of IT experience with the measures for the IT environment (*ITCD* and *IT Complexity*). A negative and significant coefficient on the interaction term (*IT Exp * ITCD* or *IT Exp * IT Complexity*) suggests that experience offsets the cost of IT control deficiencies or complexity, improving the efficiency of the audit. We also perform an F-test to evaluate if the experience is able to fully or only partially offset IT

complexity or control deficiencies on average with the test of whether the interaction plus the main effect of measures of IT environments is significantly different from zero. To test H2b, we separate the experience measures by role into IT partner and director experience (*IT Partner Exp*) versus IT manager and senior manager experience (*IT Mgr Exp*) across each type of experience (e.g., role, client, and industry). We then perform an F-test on the interaction terms to evaluate if the experience impact of the two different levels of IT staff have different associations with on audit effort (i.e., *IT Partner Exp*ITGC = IT Mgr Exp*ITGC*).

We follow the same approach to test H3a, which evaluates whether IT control deficiencies or complexity detract from financial reporting reliability by replacing model (1) dependent variable with *Restate*. *Restate* equals one if the client subsequently restated their financial statements using either a 4.02 restatement or in the absence of a 4.02 restatement (i.e., big or little r). A positive coefficient on *ITCD* or *IT Complexity* would suggest that either, on average, are associated with more financial restatements or less reliable financial reporting. Similar to H2b, we test H3b of whether experience offsets any negative impact *ITCD* or *IT Complexity* have on financial reporting reliability by adding measures of IT experience to the model and interacting them with both IT environment measures. A negative coefficient on the interaction term would suggest that IT experience offsets the costs of IT control deficiencies and complexity on financial reporting. We use an F-test of the interaction plus the main effect to evaluate if it is different from zero to tell us if the impact on financial reporting is partially or fully offset by experience. Finally, to test H3c, whether the experience of IT partner/directors differ from that of IT managers/senior managers if offsetting the *ITCD* or *IT Complexity* costs to financial reporting reliability, we use an F-test to test for differences in the interaction terms (i.e., *IT Partner Exp * ITCD = IT Mgr Exp * ITCD*) when *Restate* is the dependent variable.

4.2 Tests of Audit Effort and IT Complexity/ITCDs (H1)

Panel A of Table 4 reports our multivariate test of H1 using model (1), whether the IT complexity or control deficiencies are associated with audit effort. We estimate model (1) with three dependent variables that capture audit effort: the log of IT audit hours (*IT Hours*), the log of substantive engagement team hours (*Substantive Hours*), and the log of audit fees (*Audit Fees*) across Columns 1, 2, and 3 respectively. We find a positive and significant coefficient ($p < 0.01$) on *IT Complexity* in all three Columns, suggesting audits require more effort from both IT specialists and substantive auditors when the IT environment over financial reporting are more complex and that such increase in effort corresponds with higher fees paid by the client. An increase of one (out of 18) on the client's IT complexity measure is associated with a 6.2% increase in IT, a 2.5% increase in substantive audit hours, and a 1.9% increase in audit fees.[15] We perform untabulated analysis using seemingly unrelated regression (SUR) to test whether the impact of *IT Complexity* is more on IT hours than substantive hours and find evidence accordingly ($p < 0.01$). We also perform untabulated analysis of model (1) using *Realization Rate*,[16] a measure of engagement profitability, and find an insignificant association with IT complexity, suggesting the increase in costs related to hours are passed to the client without, on average, additional margin, such that there is no evidence of an effect to engagement profitability.

[15] We follow the methodology discussed by the UCLA statistical consulting group to calculate the economic impact of OLS regressions with log transformed dependent variables. See: https://stats.idre.ucla.edu/sas/faq/how-can-i-interpret-log-transformed-variables-in-terms-of-percent-change-in-linear-regression/.

[16] Realization rate is equal to total audit fees charged divided by the maximum audit fee the auditor would have charged had all hours been billed at their undiscounted rate, which varies depending on which staff level conducted the work (i.e. partners, director, managers, seniors or associates). The higher the realization rate, the higher the audit profitability (e.g., Bedard and Johnstone 2010 and Hoang et al. 2019).

In Table 4 Panel A, we also find evidence that IT control deficiencies are also associated with higher IT hours and substantive hours ($p < 0.01$) but not higher audit fees ($p > 0.10$). The presence of an IT control deficiency is associated with an increase of 78% in IT audit hours and by 6.8% in substantive hours. Consistent with the lesser impact of IT Complexity on the substantive versus IT audit, a SUR test indicates the effect of *ITCD* is more pronounced on *IT Hours* than *Substantive Hours* ($p < 0.01$). Replacing the dependent variable in model (1) with *Realization Rate* (untabulated) suggests that engagement profitability is lower in the presence of ITCD, consistent with increased hours but no increase in fees ($p < 0.10$ in Colum 3), also consistent with findings by Aobdia, Choudhary, and Sadka (2021) that material weakness in internal controls is associated with lower engagement profitability. Collectively these results reject H1; both IT specialist hours and substantive hours increase with IT complexity and IT control deficiencies. The results also suggest that the costs of IT control deficiencies are not on average passed to the client, unlike the costs of IT complexity.

(Insert Table 4 about here)

In Table 4 Panel B, we decompose the independent variable *IT Complexity* into its six components in model (1) for each measure of audit effort. Results indicate that more applications (*Applications*), modifications (*Modifications*), and end-user (*End User*) access are all associated with more hours spent by IT specialists and the substantive audit team ($p < 0.05$ or better). An increase in one application in the client's IT environment (*Applications*) is associated with a 66% increase in IT audit hours and a 22.8% increase in substantive audit hours. A modification to the client's IT environment (*Modifications*) is associated with a 17% increase in IT audit hours and a 6.3% increase in substantive hours. We also find that end-user (*End User*) access is associated with an increase of IT audit hours by 15.3% and substantive audit hours by 8.8%. We also find

that clients using more packaged or purchased applications (rather than customized or built in-house) are associated with fewer IT specialists and substantive hours. The economic effect of the use of 1% of applications in the IT environment being purchased is associated with a decrease of IT hours by 20%, substantive hours by 12%, and audit fees by 15%. This is consistent with the IT and substantive auditor gaining efficiencies through the use of Service Organization Control (SOC 1) reports for purchased applications possibly reducing relevant controls testing (both IT and/or substantive).[17] If a SOC 1 is available, the IT or substantive auditor does not need to evaluate compensating controls related to the application. Alternatively, if there is not a SOC 1 report, the IT auditor will have to evaluate controls. The IT auditor may be more efficient in testing controls related to purchased applications based on the auditor's experience auditing these applications on prior engagements. We find that more locations (*Locations*) are associated with more substantive hours, but not necessarily an increase in IT hours. An increase of one location is associated with an increase of substantive audit hours by 8.5%. The result may be due to the substantive auditor having to visit these locations to perform substantive procedures. The substantive auditor may also require additional testing of non-IT-related controls at these locations as processes and personnel at these locations may differ even if IT controls do not. Collectively these components translate into fees with the exception of end-user access (*End User*), which is not associated with higher fees ($p > 0.10$). An increase of one financial reporting application is (*Application*) is associated with an increase in audit fees of 18.6%. The presence of a modification (*Modifications*) is associated with an increase of audit fees by 5.1%. These results suggest the IT

[17] A SOC 1 Report (Service Organization Controls Report) is a report that states whether controls for a purchased application that is used by the client and material to financial reporting are effective or not. SOC 1 reports are not required for all purchased applications, only for certain purchased service applications with relevant controls. Discussions with practitioners indicate a majority of the time controls are deemed effective in SOC 1 reports. Current auditing standards refer to the SOC1 Report, previous names of similar reports are SAS 70 or SSAE 16.

Complexity is mostly driven by application count, modifications, end-user access, rather than locations and decentralized IT operations. Untabulated SUR tests that compare coefficients in Columns 1 and 2 indicate the effects of IT complexity components are larger on IT hours than substantive hours.

4.3 Tests of Experience Generating Audit Efficiency (H2)

(Insert Table 5 Panel A about here)

Next, we test (H2a) whether staffing considerations based on experience offset the impact of IT complexity and ITCDs on audit effort. Table 5 estimates model (1) using *IT Hours* as the dependent variable, adding IT *Role* (in Columns 1 and 2), *Industry* (in Columns 3 and 4), and C*lient* experience (in Columns 5 and 6) along with an interaction between each with *IT Complexity* (*ITCD*) in Columns 1, 3 and 5 (2, 4 and 6), respectively as independent variables. Similar findings in Table 4, we find positive and significant coefficients ($p < 0.01$) for the variable's *IT Complexity* and *ITCD* when explaining hours. The experience variables capture the average experience for manager-level team members and above. We also add to model (1) control for the average experience level of substantive team members (*Audit Exp*) to ensure our results are not driven by a correlation with general staffing decisions. In all six columns, we find a positive and significant ($p < 0.05$ or better) association between IT experience (*IT Exp*) and *IT Hours*, regardless of the type of experience, consistent with the expectation that larger engagements staff more experienced team members. We also find that in all six columns, there is a negative and significant coefficient ($p <0.05$ or better) on the interaction between *IT Complexity* (*ITCD*) and *IT Exp*, suggesting that staffing more experienced team members offsets some of the costs of IT complexity (control deficiencies). On average, as a client's IT complexity score increases by one, a one-year increase in the average experience of the IT audit team will

reduce IT audit hours by approximately 1% for role experience but only .2% and .5% for industry and client experience respectively. We also find that when a client has at least one IT control deficiency, a one-year increase in the average experience of the IT audit team will reduce IT audit hours by 13% for role experience, 7% for industry experience, and 14% for client experience.

We perform F-tests of whether the increased IT hours associated with *IT Complexity* (*ITCD*) is partially or fully offset by the experience of IT specialist. If *IT Complexity * IT Exp + IT Complexity = 0* (*ITCD * IT Exp + ITCD = 0*), then the experience will fully offset the cost of complexity (control deficiencies); if not, then it only partially offsets the cost of complexity (control deficiencies). Results of the F-test indicate the sum is positive ($p < 0.01$), such that experience does not fully offset the cost of IT complexity or ITCDs. These results are consistent with H2a that experience improves the efficiency of the audit but cannot fully compensate for the costs of IT complexity or control deficiencies.

(Insert Table 5 Panel B about here)

In Table 5 Panel B, we repeat the analysis in each column of Panel A, but separate the experience level of partners and directors (*IT Partner Exp* and *Audit Partner Exp*) from managers and senior managers (*IT Mgr Exp* and *Audit Mgr Exp*) to evaluate which roles might be more influential in combating complexity and control deficiencies. We find the experience effect documented in Panel A is driven by the manager experience, not the partner experience, as there is a negative and significant coefficient ($p <0.10$ or better) on the interaction between IT complexity and manager experience (*IT Complexity * Mgr Exp)* in Columns 1 and 5. On average, as a clients IT complexity score increases by one, a one-year increase in the average experience of the IT audit manager will reduce IT audit hours by approximately 1% for role

experience and .4% for client experience. However, F-tests that evaluate whether the coefficient on the interaction terms differ across partner versus manager experience with IT Complexity (*IT Complexity * IT Partner Exp = IT Complexity * IT Mgr Exp*) do not support statistical differences between the two ($p > 0.10$).

Similarly, we find the interactions between *ITCD* and manager experience (*ITCD * Mgr Exp*) is also negative and significant ($p < 0.01$) in Columns 2, 4, and 6. The economic impact of this result is that when a client has at least one IT control deficiency, a one-year increase in the average experience of the IT audit team will reduce IT audit hours by 27% for role experience, 8% for industry experience and 18% for client experience. Differences between partner versus manager experience effects with *ITCDs* (*ITCD * IT Partner Exp = ITCD * IT Mgr Exp*) are statistically different ($p < 0.01$). Collectively, even though IT partners are likely less focused on client relations than lead audit partners, we find evidence that manager experience, rather than partner experience, drives efficiency gains that offset complexity and especially control deficiencies in IT. This result emphasizes the importance of staffing at the manager level for audits with complex IT environments and control deficiencies.

(Insert Table 6 Panel A about here)

In Table 6 Panel A we repeat the analysis in Table 5 Panel A but focus instead on the efficiency gains from IT experience on the substantive audit. Table 6 estimates model (1) using *Substantive Hours* as the dependent variable, adding *IT Role* (in Columns 1 and 2), *Industry experience* (in Columns 3 and 4), and *Client* (in Columns 5 and 6) along with an interaction between each with *IT Complexity* (*ITCD*) in Columns 1, 3 and 5 (2, 4 and 6), respectively as independent variables. We continue to control for substantive audit experience (*Audit Exp*) in the analysis. The purpose of this test is to evaluate if there are spillover effects of efficiency gains

from IT specialist experience on the rest of the audit. We find a negative coefficient on the interaction between *ITCD* and *IT Exp* when explaining substantive hours ($p < 0.10$) is consistent with efficiency gains from IT experience spilling over to the substantive audit. We find that when a client has at least one IT control deficiency, a one-year increase in the average experience of the IT audit team will reduce substantive audit hours by 2.7% for role experience, 1.4% for industry experience, and 2.6% for client experience. However, we fail to find evidence of efficiency gains from IT experience when IT environments are complex; the interaction term is negative but insignificant ($p > 0.10$). The lack of efficiency gained by the substantive audit team in a complex IT environment audited by an experience IT auditor may be due to the complexity of the IT environment not being directly related to the substantive audit. The substantive auditor is dependent on the IT auditor's testing of IT controls. However, only an identified controls deficiency will result in a change in audit procedures for the substantive audit. Assuming there is no IT controls deficiency, the substantive auditor will perform their required procedures. Therefore, the additional time spent by the IT auditor in a complex IT environment or efficiencies gained by the IT team will not impact the time spent by the substantive auditor.

(Insert Table 6 Panel B about here)

In Panel B, we repeat the analysis in Panel A but separate the IT specialist experience by partner/direction (*IT Partner Exp* and *Audit Partner Exp*) versus manager/senior manager (*IT Mgr Exp* and *Audit Partner Exp*). We find evidence in Columns 2 and 4 that the efficiency gains in the substantive audit from IT experience in the presence of *ITCD*s is driven by managers as the interaction (*ITCD * IT Mgr Exp*) is negative and significant ($p < 0.01$). We find that in the presence of an IT control deficiency, a one-year increase in the average IT audit manager experience results in reduction of substantive hours of 1.4% for role experience, and 2.4% for

industry experience. Overall, our analyses are consistent with IT experience generating efficiency through a reduction in IT audit time spent in the wake of IT complexity and control deficiencies, as well as further efficiency gains in the substantive audit from IT experience in the wake of IT control deficiencies. Most of the efficiency gains we document are driven by staff at the management level, not the partner level.

4.4 Tests of Financial Reporting Quality and IT Complexity/ITCDs and Experience

Next, we investigate the impact of IT complexity, ITCDs, and IT experience on financial reporting quality (H3). We use a financial restatement (with or without an Item 4.02) as an indication that a client had poor financial reporting quality. *Restate* is an indicator set to one if the client restated period t financials. In Table 7, we replace the dependent variable in model (1) with *Restate*. In Panel A, we also add experience variables (*IT* and *Audit Exp*), along with interactions between *IT Exp* and *IT Complexity* (*ITCD*) in Columns 1,3, and 5 (2, 4, and 6).

(Insert Table 7, Panel A about here)

We find some evidence that *IT Complexity* detracts from financial reporting quality. In Columns 1 and 5, we find a positive coefficient on *IT Complexity* ($p > 0.10$ or better); an increase of one in *IT Complexity* is associated with an increase in the probability of restatement of 0.4% to 0.5%. We fail to find evidence that ITCDs are associated with poor financial reporting quality as the coefficient is insignificant ($p > 0.10$). The latter is consistent with the notion that auditors can audit around identified control deficiencies to achieve a similar level of financial reporting quality. Overall, we find some weak evidence to reject H3a, specifically for IT Complexity only.

To evaluate H3b, we focus on the interaction between *IT Complexity (ITCD)* and *IT Exp.* We find that the interaction is negative in Columns 1, 3 and 5, but significant only in Column 5,

industry experience ($p < 0.10$). The reduction in the probability of restatement by a one-year increase in IT auditor industry experience is only 0.1% when there is an increase of one in *IT Complexity*. These results provide weak evidence that client IT experience, in particular, mitigates the negative impact on financial reporting quality in the wake of complex IT environments. The results of an F-test (*IT Complexity * IT Exp + IT Complexity = 0*) indicate client experience only partially mitigates the impact of IT Complexity on financial reporting quality ($p < 0.10$). We fail to find evidence that IT experience mitigates ITCDs when explaining financial reporting quality ($p > 0.10$). Overall, we find weak evidence rejecting H2b, specifically only for IT Complexity and client experience.

(Insert Table 7 Panel B about here)

Finally, we separate the IT experience across roles of partner/direction (*IT Partner Exp* and *Audit Partner Exp*) from manager/senior manager (*IT Mgr Exp* and *Audit Mgr Exp*) in Panel B. Here we find a negative and significant coefficient on the interaction between *IT Complexity* and *Mgr Exp* ($p < 0.05$) for *Role* and *Client Exp* in Columns 1 and 5 and a positive coefficient on *IT Complexity* ($p < 0.05$). Similar to our findings in Table 7a, an increase of one in *IT Complexity* results in an increase in the probability of a restatement by 0.5%. Both a one-year increase in the average role and industry experience for IT managers results in a 0.1% decrease in the probability of restatement when *IT Complexity* increases by one. The coefficient on *Partner Exp * IT Complexity* is insignificant ($p>0.10$). Thus we fail to find evidence that partner experience mitigates *IT complexity* in financial reporting quality. The F-tests support weak differences between partner and manager experience ($p < 0.10$ in Column 1, but not 3 or 5). F-tests also suggest that manager experience only partially offsets the negative impact of IT complexity on financial reporting quality in Column 1 ($p<0.10$). We fail to find any association between *ITCD*

and *Restate* ($p > 0.10$) or any association between *ITCD * Mgr Exp* and *Restate* or *ITCD * Partner Exp* and *Restate* ($p > 0.10$). Collectively, the analysis in Table 7 suggests auditors, on average, are able to audit around ITCDs such that they do not negatively impact financial reporting quality. However, they are not able to fully audit around IT complexity. Further, experienced managers and senior managers, in particular, can mitigate some but not all of the negative impact of IT complexity on financial reporting quality.

Conclusion

In this study, we analyze how IT complexity and control deficiencies affect the audit. To our knowledge, our study is the first use of archival evidence to measure the effect of IT complexity and control deficiencies less severe than a material weakness over financial reporting on the auditor, allowing us to quantify the economic effects of both. We do so by developing a new IT complexity measure using PCAOB proprietary data following a theoretical framework developed by Singleton (2010). While prior literature is restricted to experimental research and implementation of a single ERP system (Brazel and Dang 2008), we use PCAOB proprietary data to examine the impact of the IT environment's state over auditing and financial reporting using inspected audit engagements from 2009-2017. We find that both IT complexity and IT control deficiencies (ITCDs) increase IT specialists and substantive audit effort but find evidence that only the cost of IT complexity is passed to the client. We find that, on average, an increase of one (out of 18) on the client's complexity score relates to an increase of 6% in IT audit hours. In comparison, the presence of an IT control deficiency relates to a 70% increase in IT audit hours.

We also provide a unique insight into whether IT specialist experience might mitigate the impact IT complexity and control deficiencies have on audit efficiency and audit effectiveness.

We utilize measures of experience of the IT auditor, identifying the number of years the auditor has served in their role, on the client, and within their industry. We are the first study to our knowledge to measure the effects of the audit team's IT experience on auditing and financial reporting. We find evidence that IT specialist experience increases the efficiency of the audit by reducing effort but cannot fully compensate for the increased effort required for complex IT environments or control deficiencies. Further, we investigate which engagement team members' experience might mitigate IT complexity or control deficiencies the most. We find the efficiency gains are mostly generated by IT managers and senior managers rather than IT partners and directors.

Finally, we find evidence that auditors, on average, can audit around ITCDs such that they do not on average detract from financial reporting quality. However, the same cannot be said of complex IT environments. Experienced IT specialists (in particular that of managers and senior managers) can partially mitigate the negative association between IT complexity and financial reporting quality. We caution the reader that our evidence is limited by the nature of our sample, which is subject to sample selection given it is based on engagements inspected by the PCAOB.

Overall, our paper provides some of the first empirical evidence on the magnitude of the impact IT complexity and control deficiencies have on the audit, expanding limited evidence of the importance and cost of technology in financial reporting. Our evidence also suggests that staffing decisions at the manager and senior manager levels are particularly important in mitigating the costs of IT complexity and control deficiencies.

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Appendix A: Variable Definition

	Variable	Definition
IT Measures	IT Complexity	See appendix B for definition
	ITCD	Binary variable taking the value of one if the auditor identified an information technology general control deficiency over the course of the audit, else zero
Construct Validity	Irregularities	Binary variable taking the value of one if an issuer has an outage, cyber-attack or fraud reported in the current year, else zero
Audit Effort	IT Hours	Total IT audit hours spent on the engagement (including other U.S. locations and non-affiliates hours), from PCAOB proprietary data.
	Substantive Hours	Total core audit hours spent on the engagement (including other U.S. locations and non-affiliates hours), from PCAOB proprietary data.
Quality	Audit Fees (thou)	Engagement audit fees from Audit Analytics
	Restate	An indicator variable equal to one if the fiscal year-end financial statements are subsequently restated as noted by Audit Analytics.
IT Auditor Experience (IT EXP)	IT Role Exp	Average number of years IT partners, directors, senior managers, and managers have been in their current role, from PCAOB proprietary data.
	IT Client Exp	Average number of years IT partners, directors, senior managers, and managers have been on the current engagement, from PCAOB proprietary data.
	IT Industry Exp	Average number of years IT partners, directors, senior managers, and managers have had clients in the same industry as the current client, from PCAOB proprietary data.
	IT Partner Role Exp	Average number of years IT partners and directors have been in their current role, from PCAOB proprietary data.
	IT Partner Client Exp	Average number of years IT partners and directors have been on the current engagement, from PCAOB proprietary data.
	IT Partner Industry Exp	Average number of years IT partners and directors have had clients in the same industry as the current client, from PCAOB proprietary data.
	IT Mgr Role Exp	Average number of years IT senior managers and managers have been in their current role, from PCAOB proprietary data.
	IT Mgr Client Exp	Average number of years IT senior managers and managers have been on the current engagement, from PCAOB proprietary data.

Appendix A: Variable Definition (continued)

	Variable	Definition
IT Auditor Experience (*IT EXP*)	IT Mgr Industry Exp	Average number of years IT senior managers and managers have had clients in the same industry as the current client, from PCAOB proprietary data.
Auditor Experience (*Audit Exp*)	Audit Role Exp	Number of years of role experience, averaged over lead partner, EQR, and other experienced team members
	Audit Client Exp	Number of years of client experience, averaged over lead partner, EQR, and other experienced team members
	Audit Industry Exp	Number of years of industry experience, averaged over lead partner, EQR, and other experienced team members
	Audit Partner Role Exp	Number of years of partner role experience.
	Audit Partner Industry Exp	Number of years of partner industry experience.
	Audit Partner Client Exp	Number of years of partner client experience.
	Audit Mgr Role Exp	Number of years of senior manager/manager role experience.
	Audit Mgr Client Exp	Number of years of senior manager/manager client experience.
	Audit Mgr Industry Exp	Number of years of senior manager/manager industry experience.
Proprietary Client Controls	Risk Rating	Risk rating of the public company given by the engagement team, and standardized across audit firm and year.
	Internal Audit	Binary variable taking the value of one if the auditor uses the company's internal audit in the testing of IT systems. Obtained from PCAOB proprietary data.
	Change Mgt	Binary variable taking the value of one if the company has had turnover in the management in any of their internal controls processes.
	Reorg	Binary variable taking the value of one if the company has had a reorganization in the current year
	Part 1 Findings	Log of Part I findings issued by the PCAOB based on the results of the inspection of the audit engagement, from PCAOB proprietary data.

Appendix A: Variable Definition (continued)

	Variable	Definition
Auditor Controls	Audit Mkt Share	Total audit fees of the office which audits the engagement divided by the total audit fees for the metro statistical area the office resides in
	Audit Office Size	Total audit fees of the office which audits the engagement
	Client Importance	Ratio of the client's annual fees for all services to the sum of annual fees forall clients of the engagement office.
	First Audit	Indicator variable when the client is a first-year audit client, from Audit Analytics.
Business Complexity Controls	Size	Natural log of total assets (in millions of $).
	Segments	Number of geographic and business segments reported in Compustat for the fiscal year.
	Foreign	Absolute value of pretax income from foreign operations (PIFO) divided by the absolute value of pretax income (PI).
	Age	Natural log of the age of the firm in years.
	Growth	Year-on-year sales growth of the client firm.
	Merger	An indicator set to one if the company had an acquisition that contributed to sales and zero otherwise.
	Accel Filer	Indicator variable set to one when the company is an accelerated filer, else zero.
	Litigation Risk	Binary variable taking the value of one if the firm's SIC code is within one of the following SIC groups: 2833–2836, 3570–3577, 3600–3674, 5200–5961, or 7370–7374, and 0 otherwise.
	ROA	Net income before extraordinary items divided by average total assets.
	Loss	1 if ROA < 0, and 0 otherwise.
	BTM	Shareholder's equity (book value) deflated by fiscal year end market capitalization
	Multinational	Binary variable if the firm is a multinational company
	Restructure	Binary variable taking the value of one if the company indicates any restructuring costs in the current year
	MW	An indicator variable equal to one if the client reports a material weakness.

Appendix B: IT Enviornment Complexity Classification

In order to measure IT complexity over financial reporting we create a categorical ranking system. Ranking issuers aims to separate groupings distinctly based on the theoretical underpinnings of IT environment complexity. We use five significant factors from Singleton 2010 to create these groupings as described below:

1) Processing Specification: decentralized (multi-location with significantly different processes), distributed (multi-location with relatively identical processes), or centralized (single location).
2) Customization Level and Number of Applications: based on a composite score using weightings of the number of applications purchased (0.1), customized (0.25), and built in-house (1).
3) Number of Locations: number of unique data center locations.
4) Modifications & New Technology: presence of either significant modifications or new technology to the accounting/financial systems introduced in the past year.
5) End User Applications: reliance on end user applications to process significant data.

We first split our sample into all the possible permutations of each of these individual factors, leaving us with a total of 40 unique combinations. We then group these 40 into smaller categories based on similar features, leaving us with a final 18, which are then ranked and sorted according to their complexity characteristics. To compose our groupings, we follow the formulas below.
All data is obtained through PCAOB:

Formulas for IT Complexity Score Classification

- Processing Levels:
    - Centralized= One server location and process do not change)
    - Distributed= Many server locations and processes do not change
    - Decentralized= Many server locations and processes change
- Count of Locations Levels:
    - Low =if there is one server location
    - Med = if there are two or three server locations
    - High= if there are greater than three server locations
- Customization & Applications
    - Formula Steps:
        - Purch = 0.1 * % purchased * Count Applications
        - PurchCust = 0.25 * % purchased&customized * Count Applications
        - InHouse = 1 * % in-house * Count Applications
        - CustAppScore = Purch + PurchCust + InHouse
    - Levels of locations:
        - High, = combined customization and application score is greater than or equal to 1.25
        - Low = combined customization and application score less than 1.25
- End User Apps Levels:
    - Yes= if the company relies on end user applications to process financial data

    - No = if the company does not relies on end user applications to process financial data
- Modifications & NewTech Levels:
    - Yes= If there has been any modifications or new technology introduced to the financial reporting process
    - No= If there has not been has been any modifications or new technology introduced to the financial reporting process

There are 40 unique permutations resulting from the combinations of these variables and their individual levels.

The following table contains these final groupings along with the color-coded levels for each factor:

Group #	Group Name	Count	Processing	Customization & Applications	Locations	Mods & New Tech	End User Apps
18	Very High-4	154	Decentralized	High	High	Yes	Mostly
17	Very High-3	116	Distributed	High	High	Yes	Yes
16	Very High-2	145	Distributed	High	High	Some	Mostly
15	Very High-1	51	Centralized	High	Low	Yes	Mostly
14	High-3	126	Distributed	High	Med	Yes	Yes
13	High-2	127	Decentralized	Med	High	No	Mostly
12	High-1	130	Distributed	High	Med	Some	No
11	Med-4	148	Distributed	High	Med	No	Yes
10	Med-3	75	Distributed	Low	Med	Yes	Some
9	Med-2	68	Decentralized	Low	Med	No	Some
8	Med-1	96	Centralized	High	Low	No	Mostly
7	Low-3	94	Distributed	Low	High	No	Mostly
6	Low-2	91	Distributed	Low	Low	Yes	Yes
5	Low-1	67	Centralized	Low	Low	Yes	Some
4	Very Low-4	221	Distributed	Low	Low	No	Yes
3	Very Low-3	104	Distributed	Low	Low	No	No
2	Very Low-2	205	Centralized	Low	Low	No	Yes
1	Very Low-1	105	Centralized	Low	Low	No	No
Total Engagements		2,123					

Based on IS complexity theory in Singleton 2010, processing specification/locations along with customization/applications are the primary driving factors of a sophisticated IT process, followed by modifications and new technology. End user applications are present in the majority of our sample.

In the “Very High” classification, the top four rankings represent those environments with the most significant complexities in all categories. The “High” bucket contains environments with high complexity in almost all the categories but one, and are ranked

accordingly. Similarly, the “Medium” and “Low” buckets have high complexity in all categories but two and three respectively. Lastly, the “Very Low” categories have close to almost no complex features. It should be noted that due to the qualitative nature of the groupings, some subjective judgment was applied in both the ranking and merging of the categories.
One of the main advantages of the categorical IT score is its interpretability- each Grouping represents a unique combination of the individual factors, therefore showing what features specifically are driving the underlying complexity. For example, two environments may both score 0.8 on the continuous scale, but with very different specifications-, i.e. one could be driven by heavy customization whereas another could be driven by many locations. The categorical system helps pinpoint where the complexity is coming from.

However, one key limitation in comparison to the continuous IT score is the lack of scalability here; by dividing the factors into groupings, granularity is sacrificed for interpretability. For example, an environment with 20 locations and one with 10 locations would both be classified as having “High” locations under this system, while the continuous score would account for these quantitative differences. Therefore, we use both versions of the score to validate our results and cover both ends.

Figure A: IT Control Deficiency (ITCD) Across IT Complexity Quintiles

Figure A presents a bar graph of the percentage of issuers that had an ITGC deficiency identified over the course of the audit in their fiscal year by IT complexity groupings broken into quintiles.

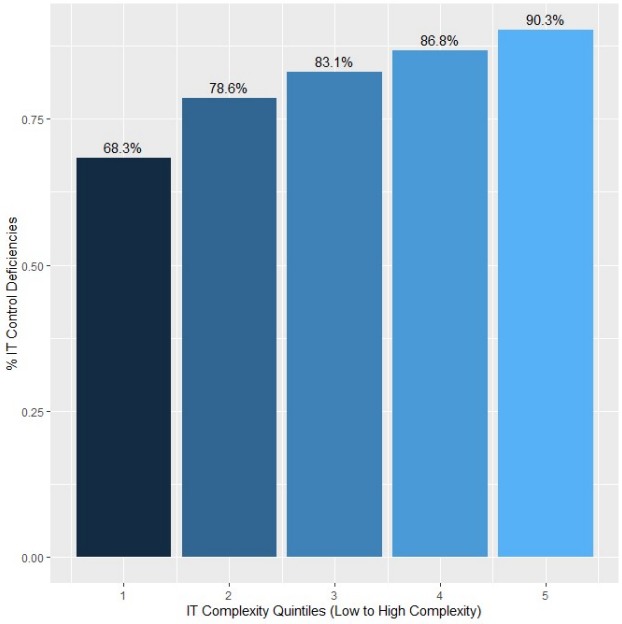

Figure B: Irregularities Across IT Complexity Quintile

Figure B presents a bar graph of Irregularities occurring at issuers, including cyber security attacks, IT outages, or fraud, by the issuer IT complexity grouping broken out by quintiles.

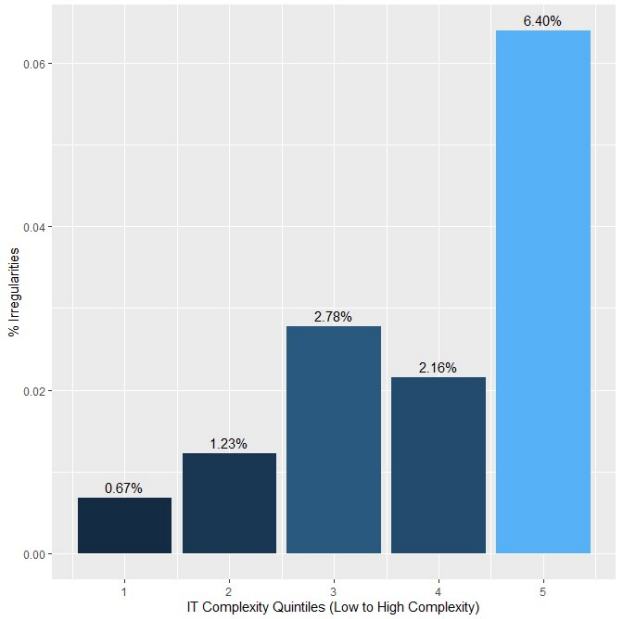

Table 1: Sample Description

Panel A: Sample Selection

Panel A describes the sample selection used in our analysis and sample loss that occurs from various data requirements. Panel B describes the sample observations by PCAOB inspection year and by auditor affiliation (Big 4 and non-Big 4) used in our analysis.

	Number of Observations
Client year observations from inspection documents 2009 - 2016	2,757
Missing IT complexity information	(453)
Missing hours data	(101)
Missing experience data	(5)
Missing dependent variables and controls (Compustat, Audit Analytics, or PCAOB)	(74)
Dropped observations with IT material weakness reported	(1)
Final sample (client-years)	2,123
Final sample unique clients	1,754

Panel B: Observations by Inspection Year and Big 4

Inspection Year	Big 4	non-Big4	Total
2009	141	65	206
2010	148	76	224
2011	149	72	221
2012	134	68	202
2013	165	78	243
2014	186	80	265
2015	178	78	256
2016	185	65	250
2017	188	67	255
Total	1,474	649	2,123

Table 2: Descriptive Statistics on IT Complexity

Panel A provides the distribution of IT Complexity score across observations in our sample. Panel B describes the IT Complexity score and its components over time.

Panel A: Observation Count Across IT Complexity Score

IT Complexity	Observations	Percent of Sample
1	105	5%
2	205	10%
3	104	5%
4	221	10%
5	67	3%
6	91	4%
7	94	4%
8	96	5%
9	68	3%
10	75	4%
11	148	7%
12	130	6%
13	127	6%
14	126	6%
15	51	2%
16	145	7%
17	116	5%
18	154	7%
Total	2,123	100%

Panel B: IT Complexity Score and Components by Year

Year	IT Complexity Score	# Applications	% Purchased Applications	# Locations	% new technology or modifications	% End-user Access
2009	8.5	8.04	48%	2.73	33%	73%
2010	9.2	8.67	53%	3	32%	77%
2011	8.4	7.16	51%	2.58	32%	76%
2012	8	6.5	56%	2.81	25%	72%
2013	9.3	10.51	55%	3.18	42%	72%
2014	9.4	8.79	56%	3.09	38%	78%
2015	9.9	9.27	57%	3.4	36%	71%
2016	10.7	10.22	56%	3.46	43%	66%
2017	10.1	10.2	59%	3.26	38%	71%
Mean	**9.3**	**8.91**	**55%**	**3.08**	**36%**	**73%**

Table 3: Sample Descriptive Statistics

	Variable	N	Mean	Std Dev	P 25	Median	P 75
IT Environment	IT Complexity	2123	9.33	5.49	4	10	14
	ITCD	2123	0.81	0.39	1	1	1
Audit Effort	IT Hours	2123	5.99	1.6	5.29	6.18	6.97
	Substantive Hours	2123	8.35	0.8	7.79	8.35	8.89
	Audit Fees (thou)	2123	14.33	1.06	13.6	14.35	15.04
Quality	Restate	2123	0.12	0.32	0	0	0
IT Auditor Experience	IT Role Exp	2123	2.31	1.53	1	2	3
	IT Client Exp	2123	8.37	4.92	5	8	11.5
	IT Industry Exp	2123	3.08	2.02	1.5	3	4
	IT Partner Role Exp	2123	0.16	0.68	0	0	0
	IT Partner Industry Exp	2123	0.73	3.08	0	0	0
	IT Partner Client Exp	2123	0.22	0.97	0	0	0
	IT Mgr Role Exp	2123	1.73	1.27	1	1.5	2
	IT Mgr Client Exp	2123	5.75	4.42	2.5	5	8
	IT Mgr Industry Exp	2123	2.54	2.07	1	2	4
Auditor Experience	Audit Role Exp	2123	2.01	1.01	1.33	2	2.5
	Audit Client Exp	2123	8.07	3.63	5.5	7.89	10
	Audit Industry Exp	2123	3.27	1.83	2	3	4.33
	Audit Partner Role Exp	2123	0.85	1.42	0	0	1
	Audit Partner Industry Exp	2123	5.65	8.61	0	0	12
	Audit Partner Client Exp	2123	1.41	2.54	0	0	2
	Audit Mgr Role Exp	2123	1.93	1	1.17	1.75	2.33
	Audit Mgr Client Exp	2123	6.74	2.99	5	7	8.5
	Audit Mgr Industry Exp	2123	3.16	1.85	1.75	3	4.25
Proprietary Client Controls	Risk Rating	2123	0.33	0.32	0	0.33	0.5
	Internal Audit	2123	0.54	0.5	0	1	1
	Change Mgt	2123	0.05	0.21	0	0	0
	Reorg	2123	0.22	0.41	0	0	0
	Part 1 Findings	2123	0.49	0.79	0	0	1.1
Auditor Controls	Audit Mkt Share	2123	0.21	0.18	0.05	0.19	0.31
	Audit Office Size	2123	17.06	1.75	15.94	17.29	18.34
	Client Importance	2123	0.17	0.25	0.02	0.07	0.19
	First Audit	2123	0	0.05	0	0	0

Table 3: Sample Descriptive Statistics Continued

	Variable	N	Mean	Std Dev	P 25	Median	P 75
Business Complexity Controls	Size	2123	7.42	1.72	6.2	7.41	8.52
	Segments	2123	6.25	6.47	3	4	7
	Foreign	2123	0.33	0.85	0	0	0.35
	Age	2123	2.93	0.7	2.4	3	3.4
	Growth	2123	0.13	0.41	-0.05	0.05	0.19
	Merger	2123	0.41	0.49	0	0	1
	Accel Filer	2123	0.64	0.48	0	1	1
	Litigation Risk	2123	0.27	0.44	0	0	1
	ROA	2123	0	0.13	-0.01	0.02	0.06
	Loss	2123	0.3	0.46	0	0	1
	BTM	2123	0.64	0.68	0.28	0.53	0.9
	Multinational	2123	0.53	0.5	0	1	1
	Restructure	2123	0	0	0	0	0
	MW	2123	0.05	0.22	0	0	0

Table 4: IT Environment and Audit Effort

Panel A and B uses three measures of audit effort as the dependent variable: the log of IT audit hours (*IT hours*), the log of substantive audit hours which excludes IT, tax, and other specialist hours (*Substantive Hours*) and the log of audit fees (Audit Fees) to test the model below in OLS. Panel A reports IT Environment Measures as the variables of interest, including an indicator for the existence of an IT control deficiency or significant deficiency (*ITCD*) and a measure of *IT Complexity* where higher values indicate more complex IT environments. Panel B breaks out the components of IT complexity as log of the number of applications (applications), percentage of applications purchased (% purchased) as compared to customized or build in-house, an indicator if the IT environment had a new system or medication installed (modification), log of the number of locations that store data (locations), an indicator if the IT operations are decentralized (decentralized), and an indicator if the end user can access the financial systems (end user). The IT complexity score is described in Appendix B. See Appendix A for other variable definitions. We estimate the equation below using OLS and report two-sided t-stats in parentheses. Significance levels * 10%, ** 5%, and *** 1%.

Audit Effort $_{i,t}$= α + β_1 IT Environment Measures $_{i,t}$+ β_2 PCAOB Client Controls $_{i,t}$ + β_3 Auditor Controls $_{i,t}$ + β_4 Business Complexity $_{i,t}$ + $\sum \beta_k$ Fixed Effects $_{i,t}$ + $\varepsilon_{i,t}$

Panel A: Audit Effort and IT Complexity/ITCD

		Y = IT hours	Y = Substantive Hours	Y = Audit Fees
		(1)	(2)	(3)
IT Environment Measures	**IT Complexity**	**0.060*** **	**0.025*** **	**0.019*** **
		(10.69)	**(11.97)**	**(7.30)**
	ITCD	**0.579*** **	**0.066*** **	**0.036**
		(8.37)	**(2.62)**	**(1.11)**
PCAOB Client Controls	Internal Audit	0.113**	0.006	0.032
		(2.00)	(0.30)	(1.20)
	Chg Mgt	-0.12	-0.03	-0.018
		(-0.97)	(-0.67)	(-0.30)
	Risk Rating	0.058	0.217***	0.06
		(0.55)	(5.56)	(1.20)
	Reorg	0.06	0.113***	-0.001
		(0.90)	(4.59)	(-0.04)
	Part 1 Findings	-0.036	-0.025**	-0.023
		(-1.04)	(-2.00)	(-1.39)
Auditor Controls	Audit Mkt Share	0.175	-0.05	0.038
		(1.05)	(-0.81)	(0.47)
	Audit Office Size	0.100***	0.073***	0.261***
		(3.49)	(7.00)	(19.23)
	Client Importance	0.500***	0.433***	1.130***
		(3.10)	(7.34)	(14.81)
	First Year	-0.232	0.115	-0.197
		(-0.44)	(0.60)	(-0.79)

Business Complexity Controls	Size	0.249***	0.228***	0.313***
		(10.83)	(26.97)	(28.67)
	Segments	0.005	0.004**	0.004**
		(1.17)	(2.34)	(1.98)
	Foreign	0.002	0.030***	0.041***
		(0.05)	(2.58)	(2.69)
	Age	0.167***	0.008	-0.023
		(3.78)	(0.50)	(-1.10)
	Growth	-0.009	-0.001	0.033
		(-0.13)	(-0.04)	(1.04)
	Merger	-0.004	0.108***	0.104***
		(-0.08)	(5.08)	(3.78)
	Accel Filer	0.025	-0.008	0.122***
		(0.45)	(-0.38)	(4.58)
	Litigation Risk	0.02	-0.05	-0.085
		(0.18)	(-1.24)	(-1.62)
	ROA	0.293	-0.122	0.051
		(1.07)	(-1.21)	(0.39)
	Loss	0.08	0.056**	-0.022
		(1.03)	(1.97)	(-0.61)
	BTM	-0.121***	-0.031**	-0.097***
		(-2.92)	(-2.02)	(-4.96)
	Multinational	0.188***	0.091***	0.209***
		(2.88)	(3.80)	(6.77)
	Restructure	-2.59	-6.131***	-8.810***
		(-0.45)	(-2.93)	(-3.26)
	MW	0.357***	0.343***	0.168***
		(3.11)	(8.15)	(3.08)
Fixed Effects	Industry	Yes	Yes	Yes
	Year	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes
`	N	2123	2123	2123
`	R-sq	50.9%	73.9%	74.9%
SUR Test of differences in coefficients Column (1) = Column (2)	IT Complexity		50.28***	
	ITCD		40.53***	

Panel B: Audit Effort and IT Complexity Components

		Y = IT Hours	Y = Substantive Hours	Y = Audit Fees
		(1)	(2)	(3)
IT Complexity Components	**Applications**	**0.507*** **	**0.205*** **	**0.171*** **
		(9.09)	**(10.19)**	**(6.47)**
	% Purchased	**-0.221*** **	**-0.126*** **	**-0.159*** **
		(-2.67)	**(-4.24)**	**(-4.03)**
	Modification	**0.157*** **	**0.062*** **	**0.050***
		(2.81)	**(3.10)**	**(1.87)**
	Locations	**0.026**	**0.082*** **	**0.008**
		(0.36)	**(3.19)**	**(0.25)**
	Decentralized	**0.115**	**0.017**	**0.042**
		(1.62)	**(0.65)**	**(1.23)**
	End User	**0.143** **	**0.084*** **	**-0.004**
		(2.48)	**(4.04)**	**(-0.15)**
IT Control Deficiency	ITCD	0.562***	0.053**	0.03
		(8.19)	(2.13)	(0.91)
Controls	PCAOB Client	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes
	Business Complexity	Yes	Yes	Yes
Fixed Effects	Industry	Yes	Yes	Yes
	Year	Yes	Yes	Yes
	Audit Firm	Yes	Yes	Yes
	N	2123	2123	2123
	R-sq	0.519	0.754	0.753
SUR test of differences in coefficients Column (1) = Column (2) Z statistics	Applications		33.22***	
	% Purchased		1.16	
	Modification		3.88**	
	Locations		0.74	
	Decentralized		2.02	
	End User		1.15	
	ITGC		39.86***	

Table 5: IT Audit Effort and IT Environment Measures Interacted with Experience

Panels A and B use the log of IT audit hours (*IT Hours*) as the dependent variable. IT Environment Measures include an indicator for the existence of one or more IT control deficiencies (*ITCD*) and *IT Complexity,* where higher values indicate more complex IT environment (see Appendix B for more explanation). Role, client, and industry experience is the average number of years of experience the IT auditors have of each type for manager level and above (IT Exp). We separate our analysis across the columns by type of experience where Role Exp is reported in Columns 1 and 2, Industry Exp in Columns 3 and 4, and Client Exp in Columns 5 and 6. We control for audit experience at the manager level and above (Audit Exp). See Appendix A for other variable definitions. In Panel B, both the IT Exp and Audit Exp is split by position across partner/directors versus managers/senior managers. T-stats are reported as two sided; significance levels are * 10%, ** 5% and *** 1%; t-stats are in parentheses.

$$\text{IT Hours}_{i,t} = \alpha + \beta_1 \text{ IT Environment Measures}_{i,t} + \beta_2 \text{ IT Exp} + \beta_3 \text{ IT Environment Measures}_{i,t} * \text{ IT Exp} + \beta_4 \text{ Audit Exp} + \beta_5 \text{ PCAOB Client Controls}_{i,t} + \beta_6 \text{ Auditor Controls}_{i,t} + \beta_7 \text{ Business Complexity}_{i,t} + \sum \beta_k \text{ Fixed Effects}_{i,t} + \varepsilon_{i,t}$$

Panel A: IT Audit Effort and IT Environment Measures Interacted with Average IT Experience

		X = Role Experience		X = Industry Experience		X = Client Experience	
		(1)	(2)	(3)	(4)	(5)	(6)
IT Enviornment Measures	IT Complexity	0.080***	0.060***	0.077***	0.060***	0.075***	0.060***
		(8.72)	(10.69)	(8.01)	(10.76)	(8.30)	(10.77)
	ITCD	0.572***	0.899***	0.564***	1.159***	0.574***	1.003***
		(8.29)	(7.66)	(8.19)	(9.64)	(8.33)	(8.88)
Experience	IT Exp	0.094***	0.139***	0.044***	0.084***	0.069**	0.139***
		(3.05)	(3.65)	(4.60)	(7.63)	(2.55)	(4.88)
	Audit Exp	-0.035	-0.036	-0.01	-0.009	-0.054***	-0.053***
		(-1.33)	(-1.37)	(-1.38)	(-1.25)	(-3.62)	(-3.58)
Interactions	**IT Complexity * IT Exp**	**-0.009*** **		**-0.002** **		**-0.005** **	
		(-2.76)		**(-2.23)**		**(-1.89)**	
	ITCD * IT Exp		**-0.143*** **		**-0.074*** **		**-0.146*** **
			(-3.41)		**(-4.73)**		**(-4.69)**
Controls	PCAOB Client	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	Business Complexity	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Yes	Yes	Yes	Yes	Yes	Yes
	Year	Yes	Yes	Yes	Yes	Yes	Yes
	Audit Firm	Yes	Yes	Yes	Yes	Yes	Yes
	N	2123	2123	2123	2123	2123	2123
	R-sq	0.513	0.517	0.516	0.523	0.511	0.512
F-Test of IT Experience offsetting IT Environment Measures	IT Complexity * IT Exp + IT Complexity = 0	104.72***		71.31***		91.03***	
	ITGC * IT Exp + ITGC = 0		75.21***		96.66***		89.74***

Panel B: IT Audit Effort and IT Environment Measures Interacted with IT Experience by Position

		X = Role Experience		X = Industry Experience		X = Client Experience	
		(1)	(2)	(3)	(4)	(5)	(6)
IT Environment Measures	IT Complexity	0.078***	0.059***	0.066***	0.059***	0.072***	0.059***
		(8.85)	(10.51)	(7.78)	(10.47)	(8.78)	(10.60)
	ITCD	0.569***	1.113***	0.563***	1.024***	0.573***	1.063***
		(8.23)	(9.99)	(8.15)	(9.41)	(8.29)	(10.36)
Experience	IT Partner Exp	0.178*	0.222*	0.036**	0.051*	0.102	0.127
		(1.85)	(1.78)	(2.05)	(1.92)	(1.46)	(1.42)
	IT Mgr Exp	0.138***	0.297***	0.034***	0.088***	0.070***	0.181***
		-3.36	-6.47	-3.15	-6.82	-2.6	-6.44
	Audit Partner Exp	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
		(-0.63)	(-0.64)	(-0.68)	(-0.60)	(-0.67)	(-1.00)
	Audit Mgr Exp	-0.008	-0.016	0.002	0.003	0.080***	0.192***
		(-0.32)	(-0.63)	(0.79)	(0.84)	(2.94)	(6.80)
Interactions	**IT Complexity * IT Partner Exp**	**-0.009**		**-0.001**		**-0.004**	
		(-1.21)		**(-0.90)**		**(-0.77)**	
	IT Complexity * Mgr Exp	**-0.010*** **		**-0.001**		**-0.004***	
		(-2.62)		**(-0.86)**		**(-1.93)**	
	ITCD * IT Partner Exp		**-0.162**		**-0.032**		**-0.077**
			(-1.24)		**(-1.14)**		**(-0.83)**
	ITCD *IT Mgr Exp		**-0.310*** **		**-0.078*** **		**-0.194*** **
			(-6.14)		**(-5.42)**		**(-6.34)**
Controls	PCAOB Client	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	Business Risk	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Yes	Yes	Yes	Yes	Yes	Yes
	Year	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	N	2123	2123	2123	2123	2123	2123
	R-sq	0.512	0.52	0.515	0.521	0.513	0.522
F-tests of partner manager differences	IT Complexity * IT Partner Exp = IT Complexity * IT Mgr Exp	2.06		0.68		3.74	
	ITCD * IT Partner Exp = ITCD * IT Mgr Exp		20.14***		14.75***		18.84***

Table 6: Substantive Audit Effort and IT Environment Measures Interacted with Experience

Panels A and B use the log of IT audit hours (*Substantive Hours*) as the dependent variable. IT Environment measures include an indicator for the existence of one or more IT control deficiencies (*ITGC*) and *IT Complexity,* where higher values indicate more complex IT environment (see Appendix B for more explanation). Role, client, and industry experience is the average number of years of experience the IT auditors have of each type for manager level and above (IT Exp). We separate our analysis across the columns by type of experience where Role Exp is reported in Columns 1 and 2, Industry Exp in Columns 3 and 4, and Client Exp in Columns 5 and 6. We control for audit experience at the manager level and above (Audit Exp). See Appendix A for other variable definitions. In Panel B, both the IT Exp and Audit Exp is split by position across partner/directors versus managers/senior managers. T-stats are reported as two sided; significance levels are * 10%, ** 5% and *** 1%; t-stats are in parentheses.

Substantive hours $_{i,t}$= α + β_1 IT Environment Measures $_{i,t}$+ β_2 IT Exp + β_3 IT Environment Measures $_{i,t}$* IT Exp + β_4 Audit Exp + β_5 PCAOB Client Controls $_{i,t}$ + β_6 Auditor Controls $_{i,t}$ + β_7 Business Complexity $_{i,t}$ + $\sum \beta_k$ Fixed Effects $_{i,t}$ + $\varepsilon_{i,t}$

Panel A: Substantive Audit Effort and IT Environment Measures Interacted with Average IT Experience

		X = Role Experience		X = Industry Experience		X = Client Experience	
		(1)	(2)	(3)	(4)	(5)	(6)
IT Enviornment Measures	IT Complexity	0.028***	0.025***	0.024***	0.025***	0.026***	0.025***
		(8.53)	(12.05)	(6.66)	(11.96)	(8.08)	(12.21)
	ITCD	0.064**	0.125***	0.065**	0.175***	0.066***	0.142***
		(2.55)	(2.92)	(2.56)	(3.93)	(2.62)	(3.44)
Experience	IT Exp	-0.003	0.005	0.003	0.015***	-0.003	0.013
		(-0.26)	(0.38)	(0.95)	(3.68)	(-0.33)	(1.23)
	Audit Exp	-0.043***	-0.043***	-0.002	-0.002	-0.027***	-0.027***
		(-4.49)	(-4.51)	(-0.87)	(-0.76)	(-5.02)	(-5.02)
Interactions	**IT Complexity * IT Exp**	**-0.002**		**0.00**		**0.00**	
		(-1.42)		**-0.33**		**(-0.59)**	
	ITCD * IT Exp		**-0.027***		**-0.014*****		**-0.026****
			(-1.74)		**(-3.02)**		**(-2.31)**
Controls	PCAOB Client	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	Business Complexity	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Yes	Yes	Yes	Yes	Yes	Yes
	Year	Yes	Yes	Yes	Yes	Yes	Yes
	Audit Firm	Yes	Yes	Yes	Yes	Yes	Yes
	N	2123	2123	2123	2123	2123	2123
	R-sq	0.744	0.744	0.74	0.741	0.744	0.744

Panel B: Substantive Audit Effort and IT Environment Measures Interacted with IT Experience by Position

		X = Role Experience		X = Industry Experience		X = Client Experience	
		(1)	(2)	(3)	(4)	(5)	(6)
IT Enviornment Measures	IT Complexity	0.020***	0.023***	0.023***	0.024***	0.025***	0.024***
		(6.39)	(11.49)	(7.85)	(11.69)	(7.68)	(11.49)
	ITCD	0.061**	0.138***	0.066***	0.121***	0.064**	0.096**
		(2.44)	(3.46)	(2.61)	(3.22)	(2.56)	(2.36)
Experience	IT Partner Exp	0.003	0.004	0.005	-0.006	0.002	-0.048
		(0.43)	(0.37)	(0.18)	(-0.19)	(0.06)	(-1.04)
	IT Mgr Exp	0	0.017***	-0.001	0.021**	0.002	0.015
		(-0.05)	(3.54)	(-0.10)	(2.06)	(0.12)	(0.89)
	Audit Partner Exp	-0.008**	-0.008**	0.017***	0.017***	0.036***	0.036***
		(-2.42)	(-2.34)	(4.25)	(4.22)	(5.20)	(5.27)
	Audit Mgr Exp	0.007***	0.007***	-0.027***	-0.027***	-0.040***	-0.041***
		(6.39)	(6.49)	(-4.99)	(-5.09)	(-4.18)	(-4.29)
Interactions	**IT Complexity * IT Partner Exp**	**0.00**		**0.001**		**0.00**	
		(0.48)		**(0.37)**		**(0.10)**	
	IT Complexity * IT Mgr Exp	**0.001***		**0.00**		**0.00**	
		(1.80)		**(0.34)**		**(-0.34)**	
	ITCD * IT Partner Exp		**0.002**		**0.022**		**0.058**
			(0.22)		**(0.65)**		**(1.22)**
	ITCD *IT Mgr Exp		**-0.014*****		**-0.024****		**-0.022**
			(-2.64)		**(-2.12)**		**(-1.17)**
Controls	PCAOB Client	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	Business Risk	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Yes	Yes	Yes	Yes	Yes	Yes
	Year	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	N	2123	2123	2123	2123	2123	2123
	R-sq	0.747	0.747	0.745	0.745	0.745	0.745
F-Tests of Partner Manager differences	IT Complexity * IT Partner Exp = IT Complexity * IT Mgr Exp	0.06		1.73		0.11	
	ITCD * IT Partner Exp = ITCD *IT Mgr Exp		1.58		3.61**		2.61*

Table 7: Financial Reporting Quality and IT Environment Measures Interacted with Experience

The dependent variable is an indicator equal to one if the client restates its financial statements (Restate). IT Environment measures include an indicator for the existence of one or more IT control deficiencies (*ITCD*) and *IT Complexity,* where higher values indicate more complex IT environment (see Appendix B for more explanation). Role, client, and industry experience is the average number of years of experience the IT auditors have of each type for manager level and above (*IT Exp*). We separate our analysis across the columns by type of experience *where Role Exp* is reported in Columns 1 and 2, *Industry Exp* in Columns 3 and 4, and *Client Exp* in Columns 5 and 6. We control for audit experience at the manager level and above (*Audit Exp*). See Appendix A for other variable definitions. In Panel B, both the *IT Exp* and *Audit Exp* is split by position across partner/directors versus managers/senior managers. T-stats are reported as two sided; significance levels are * 10%, ** 5% and *** 1%; t-stats are in parentheses.

$$\text{Restate}_{i,t} = \alpha + \beta_1 \text{ IT Environment Measures}_{i,t} + \beta_2 \text{ IT Exp} + \beta_3 \text{ IT Environment Measures}_{i,t} * \text{ IT Exp} + \beta_4 \text{ Audit Exp} + \beta_5 \text{ PCAOB Client Controls}_{i,t} + \beta_6 \text{ Auditor Controls}_{i,t} + \beta_7 \text{ Business Complexity}_{i,t} + \sum \beta_k \text{ Fixed Effects}_{i,t} + \varepsilon_{i,t}$$

Panel A: Financial Reporting Quality and IT Envronment Measures Interacted with IT Experience

		Role Experience		Industry Experience		Client Experience	
		(1)	(2)	(3)	(4)	(5)	(6)
IT Environment Measures	IT Complexity	0.004*	0.002	0.004	0.002	0.005**	0.002
		(1.72)	(1.12)	(1.42)	(1.09)	(2.05)	(1.11)
	ITCD	0.01	0.014	0.01	0.024	0.009	0.013
		(0.52)	(0.42)	(0.54)	(0.74)	(0.49)	(0.41)
Experience	IT Exp	0.007	-0	0.001	0	0.012*	0.002
		(0.78)	(-0.14)	(0.28)	(0.01)	(1.69)	(0.28)
	Audit Exp	-0	-0	-0	-0	-0.01	-0.01
		(-0.27)	(-0.27)	(-0.62)	(-0.63)	(-1.62)	(-1.55)
Interactions	**IT Complexity * IT Exp**	**-0.00**		**0.00**		**-0.001***	
		(-1.32)		**(-0.96)**		**(-1.73)**	
	ITCD * IT Exp		**-0.00**		**-0.00**		**-0.00**
			(-0.13)		**(-0.51)**		**(-0.10)**
Controls	PCAOB Client	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	Business Complexity	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Yes	Yes	Yes	Yes	Yes	Yes
	Year	Yes	Yes	Yes	Yes	Yes	Yes
	Audit Firm	Yes	Yes	Yes	Yes	Yes	Yes
	N	2123	2123	2123	2123	2123	2123
	R-sq	0.094	0.093	0.094	0.094	0.095	0.094
F-Tests of IT exp offsetting IT Environment measures	IT Complexity * IT Exp + IT Complexity = 0	2.52		2.06		3.64*	

Panel B: Financial Reporting Quality and IT Environment Measures Interacted with IT Experience by Role

		X = Role Experience		X = Industry Experience		X = Client Experience	
		(1)	(2)	(3)	(4)	(5)	(6)
IT Environment Measures	IT Complexity	0.005**	0.002	0.004	0.002	0.005**	0.002
		(2.24)	(1.22)	(1.57)	(1.05)	(2.24)	(1.22)
	ITCD	0.008	0.024	0.007	0.014	0.008	0.024
		(0.43)	(0.86)	(0.39)	(0.47)	(0.43)	(0.86)
Experience	IT Partner Exp	0.003	0.027	-0.004	0.001	0.003	0.027
		(0.17)	(1.09)	(-0.73)	(0.20)	(0.17)	(1.09)
	IT Mgr Exp	0.014*	0.005	0.004	0.001	0.014*	0.005
		(1.95)	(0.66)	(1.25)	(0.32)	(1.95)	(0.66)
	Audit Partner Exp	0.001	0.00	-0.004*	-0.004*	0.001	0.00
		(0.25)	(0.11)	(-1.66)	(-1.67)	(0.25)	(0.11)
	Audit Mgr Exp	-0.007*	-0.006	0.001	0.001	-0.007*	-0.006
		(-1.72)	(-1.61)	(0.99)	(0.98)	(-1.72)	(-1.61)
Interactions	**IT Complexity * IT Partner Exp**	**-0.001**		**0.00**		**-0.001**	
		(-0.58)		**(0.37)**		**(-0.58)**	
	IT Complexity * Mgr Exp	**-0.001****		**0.00**		**-0.001****	
		(-1.98)		**(1.29)**		**(-1.98)**	
	ITCD * IT Partner Exp		**-0.037**		**-0.004**		**-0.037**
			(-1.45)		**(-0.51)**		**(-1.45)**
	ITCD *IT Mgr Exp		**-0.004**		**-0.001**		**-0.004**
			(-0.50)		**(-0.17)**		**(-0.50)**
Controls	PCAOB Client	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	Business Risk	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Yes	Yes	Yes	Yes	Yes	Yes
	Year	Yes	Yes	Yes	Yes	Yes	Yes
	Auditor	Yes	Yes	Yes	Yes	Yes	Yes
	N	2123	2123	2123	2123	2123	2123
	R-sq	0.055	0.054	0.054	0.053	0.055	0.054
F-Tests of Partner Manager differences	IT Complexity * IT Partner Exp = IT Complexity * IT Mgr Exp	2.61*		1.10		1.95	
F-tests of Manager Exp offsetting IT Environment Measures	IT Complexity * IT Mgr Exp IT Complexity = 0	3.68*		2.57		2.89	