

9-2018


## PCAOB inspections: An analysis of entity-level and application-level control audit deficiencies

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### Recommended Citation

Mascha, Maureen F.; Lamboy-Ruiz, Melvin A.; and Janvrin, Diane J., "PCAOB inspections: An analysis of entity-level and application-level control audit deficiencies" (2018). *Accounting Publications*. 23.  
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## PCAOB inspections: An analysis of entity-level and application-level control audit deficiencies

### Abstract

The Public Company Accounting Oversight Board (PCAOB) inspection process identifies deficiencies related to how firms conduct audits. Our work extends prior research by examining the type of internal control audit deficiencies (entity-level or application-level). Internal control audit deficiencies of both types may increase the risk of material misstatement, so the PCAOB is concerned with whether audit firms are performing appropriate procedures to identify entity-level and application-level internal control audit deficiencies, including those involving information technology general controls (ITGCs). Using text analysis to examine audit deficiencies by internal control type and firm size, we find that PCAOB inspection reports identify significantly more application-level than entity-level control audit deficiencies. Application-level control deficiencies generally involve revenue, inventory, and accounts receivable accounts whereas entity-level deficiencies often involve lack of centralized controls or controls over period end financial reporting. The number of application-level deficiencies identified for both Big 4 and second-tier firms varied between inspection years 2010 and 2015. However, the number of entity-level deficiencies, including ITGCs for both Big 4 and second-tier firms, held nearly steady during the period. Our findings should be of interest to practicing accountants, regulators, and other users of PCAOB inspection reports.

### Keywords

Internal control audit deficiency, Entity-level control, Application-level control, PCAOB inspection, Inspection report

### Disciplines

Accounting | Business Administration, Management, and Operations | Business Law, Public Responsibility, and Ethics | Corporate Finance | Finance and Financial Management

### Comments

This accepted article is published as Mascha, M. F., M. Lamboy-Ruiz, and D. Janvrin. 2018. PCAOB Inspections: An Analysis of Entity-level and Application-level Control Deficiencies, *International Journal of Accounting Information Systems* 30: 19-39. doi: [10.1016/j.accinf.2018.06.002](https://doi.org/10.1016/j.accinf.2018.06.002). Posted with permission.

## PCAOB Inspections: An Analysis of Entity-level and Application-level Control Audit Deficiencies

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May 2018

We acknowledge research assistance from Joseph Tetzlaff and helpful comments from Chris Anderson, David Coss, Rajenda P. Srivastava, and participants at the 2016 AAA Diversity Section Midyear meeting, 2017 AAA AIS Midyear meeting, 2017 AAA annual meeting, and the University of Waterloo Centre on Information Integrity and Information Assurance 10<sup>th</sup> Biennial Symposium.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## PCAOB inspections: An analysis of entity-level and application-level control audit deficiencies

### ABSTRACT

The Public Company Accounting Oversight Board (PCAOB) inspection process identifies deficiencies related to how firms conduct audits. Our work extends prior research by examining the type of internal control audit deficiencies (entity-level or application-level). Internal control audit deficiencies of both types may increase the risk of material misstatement, so the PCAOB is concerned with whether audit firms are performing appropriate procedures to identify entity-level and application-level internal control audit deficiencies, including those involving information technology general controls (ITGCs). Using text analysis to examine audit deficiencies by internal control type and firm size, we find that PCAOB inspection reports identify significantly more application-level than entity-level control audit deficiencies. Application-level control deficiencies generally involve revenue, inventory, and accounts receivable accounts whereas entity-level deficiencies often involve lack of centralized controls or controls over period end financial reporting. The number of application-level deficiencies identified for both Big 4 and second-tier firms varied between inspection years 2010 and 2015. However, the number of entity-level deficiencies, including ITGCs for both Big 4 and second-tier firms, held nearly steady during the period. Our findings should be of interest to practicing accountants, regulators, and other users of PCAOB inspection reports.

#### *Keywords:*

Internal control audit deficiency  
Entity-level control  
Application-level control  
PCAOB inspection  
Inspection report

#### *Data availability:*

All data sources in this study are publicly available.

## PCAOB inspections: An analysis of entity-level and application-level control audit deficiencies

Audit and national office professionals must appropriately address known deficiencies in their auditing of high-risk areas, and auditors must have the fortitude to refuse to sign off on an audit if important issues remain unresolved (SEC, 2016).

—Andrew J. Ceresney, Director of the SEC’s Division of Enforcement, October 18, 2016

### 1. Introduction

The Sarbanes-Oxley Act (SOX), sections 302 and 404, requires that U.S. publicly traded companies implement, maintain, and test a system of internal controls to reduce the probability of material financial statement misstatement, and it mandates that auditors must evaluate these internal controls. The Public Company Accounting Oversight Board (PCAOB) inspection process identifies deficiencies in how firms conduct audits, including those deficiencies related to internal controls. Recently, researchers have begun to analyze PCAOB inspection reports to understand these audit deficiencies (Church and Shefchik, 2012; Nagy, 2014). Audit deficiencies are defined as issues for which sufficient, competent evidential matter does not appear to have been collected in support of the audit opinion on the issuer’s financial statement (PCAOB, 2008, 7).<sup>1</sup> Research examining PCAOB inspection reports suggests that (1) audit deficiencies appear to be decreasing, at least among those firms auditing more than 100 issuers annually (Church and Shefchik, 2012); that (2) audit deficiencies involve all areas of the audit process: planning, testing, and reporting (Hogan et al., 2008); that (3) audit deficiencies involve both account balances and internal controls (Hogan et al., 2008); that (4) auditors may increase their audit effort when they expect their work will be inspected by the PCAOB

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<sup>1</sup> Similar to most prior research (Acito et al., 2017; Church and Shefchik, 2012; Drake et al., 2016; Nagy, 2014), this study examines publicly available PCAOB inspection report Part II findings. In contrast, Aobdia and coauthors use a proprietary database to explore how PCAOB Part I findings, which are not available to the public, impact audit quality (Aobdia, 2016a; Aobdia, 2016b; Aobdia, 2016c; Aobdia et al., 2016).

(Stefaniak et al., 2017); that (5) clients use PCAOB inspection reports as a proxy for auditor quality and undertake personnel changes based on the timing and extent of cited deficiencies (Abbott et al., 2013; Nagy, 2014; Robertson et al., 2014); and that (6) fair value audit deficiencies may reduce the information uncertainty of complex estimates (Dee et al., 2017).

PCAOB-identified audit deficiencies may include those related either to accounts or to internal controls, and they may involve technology issues such as information technology general controls (ITGCs) (Hogan et al., 2008). Internal controls are usually categorized as either entity-level or application-level, and these are the two types we analyze in this study. Entity-level controls (sometimes referred to as “general controls” in textbooks [e.g., Romney and Steinbart, 2018]) are meant to oversee the internal control environment (Dickins and Fay, 2017; Kinney et al., 2013). ITGCs are entity-level controls specifically involving information processed and stored electronically (Singleton, 2013). Deficiencies from entity-level control failure may affect the internal control environment and ultimately the quality of financial statements (Church and Shefchik, 2012). By contrast, application-level controls (also known as “transaction-level controls”) govern a specific account or subset of accounts and regulate access to and processing of account transactions (Romney and Steinbart, 2018). Deficiencies resulting from application-level controls not operating properly may introduce erroneous and/or fraudulent transactions into the system, but such risks generally do not affect *all* transactions or the system as a whole (PCAOB, 2007a). However, multiple application-level control deficiencies for one issuer may suggest that this issuer has poor entity-level controls, and thus the auditor should look for causal ITGC weaknesses and/or deficient auditing of ITGCs.

While initial research on PCAOB inspections has identified deficiencies and categorized them by account and frequency (Church and Shefchik, 2012; Landis et al., 2011), the type of internal control deficiencies in general and entity-level deficiencies in particular, including those involving ITGCs, has not been examined extensively,<sup>2</sup> despite the fact that entity-level internal control deficiencies often result in financial statement misstatements (Church and Shefchik, 2012) and that performance issues must be identified before audit firms can develop better audit procedures to address these concerns (Bonner, 1999). In addition, Big 4 and second-tier firms may have different issuer-client portfolios and access to different resources (Church and Shefchik, 2012). Depending on their size, firms may use different procedures to examine internal controls, which could ultimately affect the audit outcome (Janvrin et al., 2009). Thus, we compare the type of control audit deficiencies between Big 4 and second-tier firms. Specifically, we examine whether control deficiency trends changed over time in response to (1) recent efforts by the Securities and Exchange Commission (SEC) and the PCAOB to emphasize the need for audit firms to obtain sufficient evidence to support their internal control opinion (DeFond and Lennox, 2017) and (2) the adoption of Auditing Standard No. 13, which stresses the importance of entity-level controls during risk assessment (Gerkes et al., 2007; PCAOB, 2012).

Using text analysis as our method of inquiry, we focus on the type of internal control deficiencies, including those involving ITGCs, by examining PCAOB reports for control

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<sup>2</sup> Church and Shefchik (2012) discuss internal control reporting in PCAOB inspection reports as a “secondary issue.” DeFond and Lennox (2017) classify internal control deficiencies into two broad content categories: (1) control processing, which includes inadequate tests of internal controls that may potentially result in a failure to detect the existence of a material weakness, and (2) control reporting, which includes inappropriate evaluation of the materiality of a detected weakness that may potentially result in a failure to report a material weakness.

infractions by Big 4 and second-tier U.S. firms from inspection years 2010 to 2015. We have four reasons for our study design. First, internal control audit deficiencies are emerging as specific, separate, reportable events from a PCAOB standpoint, as evidenced by the issuance of Auditing Standard No. 13 (PCAOB, 2010) and other PCAOB communication (DeFond and Lennox, 2017; PCAOB, 2017a, 2017b). Second, prior research examining the content of inspection reports focused on account-level audit deficiencies and treated internal control audit deficiencies as “secondary” (Church and Shefchik, 2012) or classified them as affecting either internal control processing or internal control reporting (DeFond and Lennox, 2017). We believe that internal control audit deficiencies warrant further examination given that such deficiencies are critical to audits of both financial statements and internal controls over financial reporting whose failure may result in misstatement (Kinney et al., 2013). Third, internal control deficiencies, particularly ITGCs, often impact clients’ IT systems, which are increasingly important as clients adopt newer technologies (Klamm and Watson, 2009; PCAOB, 2017a; Wallace et al., 2011). Fourth and finally, Church and Shefchik (2012) found that the number of control audit deficiencies decreased for inspection years 2004 to 2007 and then increased in inspection year 2009. We compare inspection reports across a more recent six-year horizon—inspection years 2010 to 2015 (issued in years 2011 to 2016)—to examine whether this trend has continued in light of the recent changes to the auditing environment discussed above.

Our results indicate that the PCAOB identified significantly more application-level control than entity-level control deficiencies for inspection years 2010 to 2015. The most commonly cited application-level control deficiencies involved the accounts of revenue, inventory, and accounts receivable, whereas the most common entity-level deficiencies



involved a lack of centralized processing controls, including those related to shared service environments and period-end financial reporting process controls. Furthermore, 35% of all Big 4 issuers examined by the PCAOB had deficiencies, and 17% of those were control deficiencies. For second-tier issuers, 45% had deficiencies, and 16% of those involved control deficiencies. The proportion of all control deficiencies classified as application-level or entity-level deficiencies varied by firm size. For Big 4 firms, 75% of all control audit deficiencies were application-level, whereas for second-tier firms only 66% of all control deficiencies were application-level, with the remaining 34% involving entity-level deficiencies. Longitudinally, the number of application-level internal control deficiencies identified for both Big 4 and second-tier firms varied from inspection year 2010 to inspection year 2015. However, the number of entity-level internal control audit deficiencies including ITGCs remained relatively steady through the period for both Big 4 and second-tier firms.

Our study is important because audit deficiencies have implications for practicing accountants, regulators, audit committee members, and users of inspection reports (Church and Shefchik, 2012; DeFond and Lennox, 2017; Persellin, 2013; Calderon et al., 2016), and few prior studies have examined the type of internal control audit deficiencies (Eutsler, 2017). In addition, our findings inform both researchers and practitioners on the state of PCAOB internal control reporting by addressing what Hogan et al. (2008) characterized as a paucity of research on internal control deficiencies, specifically entity-level deficiencies. For example, our results indicating that the number of application-level and entity-level internal control deficiencies did not decrease between inspection years 2010 and 2015 may be ascribed to one of several factors that would require follow-up research to determine the likely cause.

The paper is organized as follows. The next section discusses the PCAOB inspection process, reviews relevant literature on internal control systems, and presents our research questions. The third section describes the methodology we used to assess PCAOB inspection reports. The fourth reports our results, and the fifth section offers conclusions and suggestions for future research.

## **2. Background and research questions**

### *2.1 PCAOB inspections*

At the heart of SOX (2002) is the mandate for all U.S. public companies to implement, maintain, and test a system of internal control that is effective in the prevention and/or detection of material financial statement misstatement (sections 302 and 404). Key to SOX is the creation of the PCAOB (section 104), whose role includes inspecting audit firms' performance regarding audits of public companies. The PCAOB inspects registered U.S. firms auditing more than 100 issuers annually and firms that regularly audit 100 or fewer issuers at least triennially. Following each inspection, the PCAOB issues a report that details the audit deficiencies identified (Boone et al., 2015, 2017). These deficiencies are not released to the general public until after the audit firm has been given 12 months to address the issues (Drake et al., 2016). Similar to prior research (Church and Shefchik, 2012; DeFond and Lennox, 2017; Drake et al., 2016; Nagy, 2014), we examine the Part II deficiencies that the PCAOB has made public.

The PCAOB (2012) defines deficiencies as those situations where the auditor has failed to gather sufficient evidence to support the opinion that the financial statements are fairly stated or the opinion that the company's internal control is effective. This study concentrates

on deficiencies related to internal controls. An effective internal control system, aside from its mandate in SOX, extends beyond the mere detection/prevention of fraud. Prior research documents that effective internal controls affect bond ratings, credit risk, and analysts' estimates of company performance (Bell and Carcello, 2000; Elbannan, 2008), as well as cash flows, profit, and accrual quality (Doyle et al., 2007).

## 2.2 Type of control audit deficiencies

While SOX prescribes the necessity of having internal control to prevent material misstatements, it refers readers to the Committee of Sponsoring Organizations of the Treadway Commission (COSO) framework for identifying control activities (COSO, 1992; Klamm and Watson, 2009).<sup>3</sup> This framework, expanded in 2013 to reflect the integration of accounting and business systems, does not expressly identify controls by type (e.g., entity versus application) (COSO, 1992, 2013).<sup>4</sup> While the PCAOB (2007a) identifies pervasive, general controls governing access to an organization's resources as "entity-level," there are differing terms for controls at the process or transaction level. Reviewing the literature and instructional materials (e.g., Romney and Steinbart, 2018), we adopt the term "application-level" control to represent those controls that oversee transaction processing. As such, the dichotomy we adopt to classify control audit deficiencies recognizes "entity-level" and "application-level" as two distinct types of controls.

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<sup>3</sup> COSO's *Internal Control—Integrated Framework* was originally published in 1992. The majority of U.S. publicly traded companies have adopted the 1992 framework (updated in 2013) to assess and report on the design and operating effectiveness of their internal controls annually.

<sup>4</sup> In discussing the five components that make up the framework, COSO (1992, 2013) indicates that the "internal control environment" is an example of an entity-level control. However, the other components are not classified as entity-level or application-level controls.

To guide practitioners on the type of internal control, the PCAOB (2007a) issued a position paper proposing that internal control be understood as a “pyramid” consisting of five levels or strata, with entity-level controls at the top and application-level controls at the base. Essentially, the difference in the type of internal control is scope. While material misstatement can occur because internal controls are lacking, entity-level controls are more pervasive, as they affect the execution of other controls and have a direct impact on functions such as the financial close process and the generation of financial statements (PCAOB, 2007b). Auditing Standard No. 5 classifies entity-level controls into several categories including monitoring management override of controls and central processing controls (PCAOB, 2007a). The financial close process presents entity-level risks to the firm because of its complexity. This complexity, defined as the number and type of processes involved (AICPA, 2002), introduces uncertainty into auditors’ risk assessment (Asare et al., 2013), and uncertainty may lead to a failure to identify internal control deficiencies and/or to an inaccurate assessment of their impact on the financial statements, potentially resulting in material misstatements going undetected (AICPA, 2002). In sum, the failure of entity-level controls impacts the entire internal control environment. For example, the lack of entity-level controls was a factor in the WorldCom audit failure because unauthorized individuals were permitted to process fraudulent journal entries in the absence of access controls (Hogan et al., 2008). When auditors discover entity-level control failures, additional testing is needed. We examine not only entity-level control deficiencies collectively but also categorize these control deficiencies according to Auditing Standard No. 5 classification.

By contrast, application-level controls (also known as “transaction-level controls”) govern a specific account or subset of accounts, regulate access to and processing of transactions, and are often unique to a particular account or group of accounts (Romney and Steinbart, 2018). Application-level controls may affect one or more financial statement accounts (PCAOB, 2007a). For example, failure to examine how clients estimate bad debt expense impacts the related accounts receivable and its allowance for bad debt account. The failure of an application-level control to operate properly has the potential to introduce erroneous and/or fraudulent transactions into the system, but such risks may not affect *all* transactions or the system as a whole (PCAOB, 2007a). However, application-level control deficiencies may result in financial statement misstatement if multiple application-level controls are identified for a specific issuer and/or the accounts in question materially affect the financial statements. So we examine the PCAOB inspection reports to identify which accounts are affected by the application-level control deficiencies disclosed in the reports. Our first research question examines the type of control audit deficiencies reported by the PCAOB:

RQ1: What types of control audit deficiencies (entity-level or application-level) are identified by the PCAOB?

### *2.3 Impact of firm size on type of control audit deficiencies*

Control audit deficiencies identified by the PCAOB may vary by firm size. For example, Big 4 audit firms are more likely than second-tier firms to have the resources needed to adopt and use IT-related audit procedures (Janvrin et al., 2009; Lowe et al., 2018). Further, Big 4 audit firms have clients that are more likely to have complex IT, necessitating that these firms make significant investments in their own IT to audit such clients efficiently and effectively (Bills et al.,

2016; Keune et al., 2016). Church and Shefchik (2012) argue that smaller audit firms may be unable to tolerate the exposure associated with risky clients and thus encounter less complex auditing issues. Furthermore, given that risky clients often have highly complex IT, smaller audit firms are less likely to have clients with complex IT. Finally, even if smaller audit firms have clients with complex IT, they often do not have sufficient resources to adopt significant IT to examine these clients properly (Curtis and Payne, 2008; Rosli et al., 2012). This creates a potential economic stratification dividing firms of different sizes, with implications for audit efficiency and effectiveness (Janvrin et al., 2008 Gerakos and Syverson, 2015). Thus, we examine whether the type of control audit deficiencies varies by firm size with the following research question:

RQ2: Do the types of control audit deficiencies identified vary by firm size?

#### *2.4 Impact of time on type of control audit deficiencies*

The type of internal control deficiencies identified by the PCAOB may differ over time. For example, DeFond and Lennox (2017, 2) postulate that a decline in the frequency of adverse internal control opinions from 2005 to 2009 prompted the SEC to suggest that auditors may be failing to identify and report material internal control deficiencies. As a secondary analysis, Church and Shefchik (2012) examined internal control deficiencies for inspection years 2004 to 2009 for both Big 4 and second-tier firms. They found that internal control deficiencies decreased for inspection years 2004 to 2007 and then increased by inspection year 2009. In addition, the PCAOB explicitly directed that its inspectors assess whether auditors were obtaining appropriate evidence to support their internal control opinions and to identify any deficiencies in this process (DeFond and Lennox, 2017; Franzel, 2014). Finally, Auditing

Standard No. 13 (PCAOB, 2010) highlights the importance of internal controls when evaluating the risk of a material misstatement. Specifically, Auditing Standard No. 13 requires that auditors assess the control environment for each assertion being tested, paying particular attention to data processed electronically (PCAOB, 2010, paragraphs 16–18).<sup>5</sup> It is uncertain though whether auditors have responded to these changes and/or the PCAOB has concentrated its inspection efforts on examining how auditors review an issuer’s internal control systems. Thus, we examine the type of control audit deficiencies identified over time as our third research question:

RQ3: Do control audit deficiencies vary from inspection years 2010 to 2015?

### 3. Methodology

This study investigates PCAOB reports for inspection years 2010–2015. These reports were publicly issued between 2011 and 2016.<sup>6</sup> We examine reports for the eight largest audit firms based on U.S. revenue that are inspected annually and categorize the firms into two groups: Big 4 and second-tier firms.<sup>7</sup> Inspection reports for the following firms were reviewed:

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<sup>5</sup> As noted above, AS No. 13 is focused on the procedures for identifying application-level deficiencies and the circumstances where additional testing for risk assessment is required. In contrast, AS No. 5 establishes the framework for internal controls over financial reporting audits including detailed definitions regarding the components of internal control and the levels of control deficiencies that may result in adverse opinions.

<sup>6</sup> A complete list of PCAOB reports issued is available on the inspection page of the PCAOB’s website: <https://pcaobus.org/Inspections/Pages/default.aspx>.

<sup>7</sup> While the PCAOB also inspects foreign firms that provide audit reports for U.S. issuers (Krishnan et al., 2017), we focus on U.S. firms. Following prior research including Hogan and Martin (2009) and Aobdia (2016a), we define “second-tier” audit firms to include Grant Thornton, BDO, Crowe Horwath, and RSM. We acknowledge that during inspection years 2010 to 2015, the PCAOB also inspected Malone Bailey annually (PCAOB, 2017a). We analyzed their inspection reports and found six application-level control deficiencies and no entity-level deficiencies. We elected not to include Malone Bailey results in our data collection, as the firm was not included among second-tier firms by Hogan and Martin (2009) or Aobdia (2016a).

the Big 4—PricewaterhouseCoopers (PwC), Ernst & Young (EY), Deloitte, and KPMG; and second tier—Grant Thornton, RSM,<sup>8</sup> BDO, and Crowe Horwath. We downloaded the inspection reports for all the firms and analyzed each report separately. Our population consisted of 16 inspection reports for the Big 4 firms and 16 reports for the second-tier firms.

We then used text analysis to identify internal control deficiencies in general, distinguish between application-level and entity-level control deficiencies, classify entity-level control deficiencies into Auditing Standard No. 5 (PCAOB, 2007a) categories, and identify accounts associated with application-level control deficiencies. To begin, each inspection report was imported into NVivo, a content analysis software program validated by prior research (Siccama and Penna, 2008) and used in other recent research studies (Bills et al., 2016). NVivo offers users several tools, such as word frequency count, word context analysis, and word cloud diagramming that depicts potential associations among terms to assist researchers in identifying patterns and trends in the content. We followed an iterative stepwise procedure in carrying out our text analysis, the steps of which are diagrammed and described in Exhibit 1. Following prior research advice (Fisher et al., 2010; Li, 2010; Loughran and McDonald, 2016; Zhang et al., 2017), we performed a manual review of the output of the software program at each step in the text analysis process.

[Insert Exhibit 1 about here.]

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<sup>8</sup> On October 26, 2015, McGladrey LLP changed its name to RSM US. We refer to this firm as RSM in our study, although its official company name on the early PCAOB inspection reports examined was McGladrey LLP.



We initially used NVivo's word cloud feature to identify terms associated with *internal control*. A word cloud displays the frequency of all words found in a text by producing a diagram of the most common words, sized according to their frequency of appearance (Figure 1). We used this feature to identify the text passages associated with *internal control*. In addition, we examined the word cloud for additional words closely associated with *internal control* and performed text search queries and generated word clouds for these words as well. Figure 2 displays the text search results in a word tree for *internal control* in Panel A and *entity-level* in Panel B. Each text passage identified was then manually reviewed to determine whether the passage actually discussed an internal control deficiency or not.

[Insert Figures 1 and 2 about here.]

Next, we analyzed each internal control deficiency identified to determine whether it should be classified as entity-level or application-level by examining word clouds using the terms *entity* and *application*. We followed up with additional word clouds using words directly associated with these terms as identified in the initial word cloud. These directed word searches for entity controls included the following terms: *manual journal entries, financial close, program change controls, ITGC, access controls, and general controls*. We then examined each text passage containing the keyword and initially classified the passage as belonging to entity-level or application-level control deficiency. Our initial classification of passages by these two types was dichotomous and mutually exclusive.

We identified entity-level control deficiencies based on three criteria. First, if the inspection report identified the deficiency as an entity-level control, we included it. The other

two criteria were not as straightforward. The second criterion classified deficiencies identified as "general controls" as entity-level, given the pervasive top-down nature of general controls that some authors define as entity-level controls (Romney and Steinbart, 2019). We also used word searches for *access, manual journal entry, journal entry, software changes, unauthorized access, and board of directors*.

The final criterion for entity-level control deficiencies involved judgment. If a passage contained content describing a deficiency having a pervasive effect on the organization, or if the deficiency had a direct effect on multiple major accounts or otherwise indicated that the deficiency affected the whole organization, we classified the deficiency as an entity-level control. We separately identified any entity-level deficiencies that the inspection report cited as "information technology general controls" or "ITGC" given that many issuers today employ highly complex computerized financial reporting systems.

For application-level control deficiencies, we identified the common accounts mentioned under application-level deficiencies from our initial word cloud. NVivo results indicated that the accounts of *accounts receivable, revenue, inventory, allowance for loan loss, PP&E, and goodwill impairment* had the most common application-level internal control deficiencies. Again, we examined the text associated with each mention of these account deficiencies and categorized the internal control issue according to the account categorization scheme, as explained below.

Once we believed we had captured all salient data, we recorded the entity-level and application-level deficiencies in a spreadsheet, noting the issuer, page number where the text

appeared, and text passage from the PCAOB inspection document. A graduate assistant who was not aware of the purpose of the study then reviewed each internal control deficiency to confirm the accuracy of our coding. After making our initial dichotomous classification of deficiencies as either entity-level or application-level, we proceeded to categorize the deficiencies within each type for a more granular breakdown conducive to statistical comparisons.

To examine more finely the entity-level control deficiencies identified, we categorized each entity-level control as suggested by paragraph 24 of Auditing Standard No. 5 (PCAOB, 2007a). Specifically, Auditing Standard No. 5 states that entity-level controls include controls related to (1) the control environment; (2) management override;<sup>9</sup> (3) issuer's risk assessment process; (4) centralized processing, including shared service environments; (4) monitoring the results of operations; (5) monitoring other controls, including activities of the internal audit function, the audit committee, and self-assessment programs; (6) the period-end financial reporting process; and (7) policies that address significant business control and risk management practices. One author and one graduate student independently classified the entity-level controls according to these categories and met to resolve differences. The few differences in coding noted (less than 2%) were resolved through discussion and consultation with the first author. In addition, we associated each entity-level deficiency categorized

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<sup>9</sup> Auditing Standard No. 5 states, "Controls over management override are important to effective internal control over financial reporting for all companies, and may be particularly important at smaller companies because of the increased involvement of senior management in performing controls and in the period-end financial reporting process. For smaller companies, the controls that address the risk of management override might be different from those at a larger company. For example, a smaller company might rely on more detailed oversight by the audit committee that focuses on the risk of management override" (PCAOB, 2007a, paragraph 24). The AICPA (2005) notes that management override of internal controls is the "Achilles' heel" of fraud prevention.

according to Auditing Standard No. 5 with both firm size (the four Big 4 firms and four second-tier firms) to address RQ2, and with time (years 2010–2015) to address RQ3.

To examine more closely the application-level control deficiencies, similar to the approach taken by Church and Shefchik (2012), we used the results of the initial NVivo word count for *application control* to identify the specific account that was referenced for each application-level control deficiency. Iterative searches on words closely associated with our initial word count were performed to ensure that all accounts referenced for each application-level control deficiency were identified. We discovered that some application-level control deficiencies referred to more than one account. We also related the accounts affected by each application-level deficiency to firm size, to address RQ2, and to time, to address RQ3.

## 4. Results

### 4.1 Type of control deficiencies

RQ1 investigates the type of control audit deficiencies. Table 1 lists the number of issuers with deficiencies for all audit firms. Exhibit 2 illustrates selected comments from the inspection reports. As shown in Panel A of Table 1, the PCAOB inspection teams found deficiencies in 38% (703) of the issuers they examined for the largest eight audit firms for inspection years 2010 to 2015. Of the 5,209 total deficiencies identified, 17% (869) were control-related, and 83% (4,339) were other deficiencies. Panel A of Table 2 shows that 27% (237) of the 869 control deficiencies identified were classified as entity-level control deficiencies and 73% (632) were classified as application-level control deficiencies. Finally, 43% (101) of the entity-level control deficiencies involved ITGCs.

[Insert Exhibit 2 and Tables 1 and 2 about here.]

#### *4.1.1 Classification of entity-level control deficiencies*

We categorized entity-level control deficiencies by Auditing Standard No. 5 categories as shown in Table 3. Ninety-four (40%) of these entity-level deficiencies involved centralized processing and controls, including shared service environments; 58 (24%) related to controls over the period-end financial reporting process; and 30 (13%) involved controls to monitor results of operations. Untabulated results suggest that many entity-level control deficiencies involving centralized processing and controls were related to examining access controls over data and system resources—for example, auditors’ improper examination of the ability to change program logic, failure to restrict programmer access to system resources, or unlimited access to computer resources. The most frequently cited controls over the period-end financial reporting process were manual adjustments/journal entries, failure to coordinate financial close, and unlimited access to accounting system resources.

[Insert Table 3 about here.]

#### *4.1.2 Classification of application-level control deficiencies*

Panel A of Table 4 identifies the accounts involved for the application-level control deficiencies. Similar to DeFond and Lennox (2017), Panel B reports the deficiencies identified in PCAOB inspections scaled by total number of issuers with deficiencies. Panel B shows that 25% of all issuers with deficiencies had deficiencies involving revenue accounts, 17% of all issuers with deficiencies had deficiencies related to inventory accounts, and 14% of all issuers had deficiencies related to accounts receivable. Further, 10% of all issuers with deficiencies experienced deficiencies concerning investment accounts.

[Insert Table 4 about here.]

#### 4.2 Impact of firm size on control audit deficiencies

RQ2 asks whether the type of control audit deficiencies varies by firm size. As shown in Table 1, Panels B and C, the PCAOB found deficiencies in 35% of the audits performed by Big 4 firms and found deficiencies in 45% of the audits performed by second-tier firms. Tests of equality of proportions show a statistically significant difference between deficiency rates by firm size, where  $\chi^2 = 15.26$  and  $p < 0.0001$ .

Of the 3,601 total deficiencies identified for Big 4 firms, 617 (17%) were control deficiencies. The percentage of total deficiencies identified as control deficiencies varied by Big 4 firm, ranging from 16% of total deficiencies identified as control deficiencies for Deloitte and KPMG, to 20% of total deficiencies identified as control deficiencies for PwC. For second-tier firms, 253 (16%) of the 1,608 total deficiencies identified were control deficiencies. Control deficiencies as a percentage of total deficiencies also varied for the second-tier firms, ranging from 12% of total deficiencies for RSM to 21% for Crowe Horwath. Tests of equal proportions were used to compare differences in frequency counts between the two groups (Pedhazur and Schmelkin, 1991). Untabulated results indicate that the difference between Big 4 and second-tier firms for their proportion of total control deficiencies relative to all other deficiencies identified was not statistically significant ( $\chi^2 = 1.57$ ;  $p = 0.211$ ).

Table 2, Panel D indicates that of the control deficiencies attributed to Big 4 firms, 151 (25%) were entity-level and 465 (75.5%) were application-level. Of the entity-level deficiencies, 55 (9% of all internal control deficiencies or 36% of the entity-level deficiencies) involved ITGCs.

As for the second-tier firm control deficiencies, Panel G of Table 2 indicates that 86 (34%) were entity-level and 167 (66%) were application-level. Thus, the mix between entity-level and application-level control deficiencies demonstrated a higher proportion of entity-level control deficiencies for second-tier firms than for Big 4 firms. Of the entity-level deficiencies for second-tier firms, 46 (18% of all internal control deficiencies or 53% of entity-level deficiencies) involved ITGCs.

To examine differences in the impact of firm size on the proportion of control deficiencies that were entity-level versus application-level, we performed chi-square tests of equality between two equal proportions for the two groups (Big 4 and second-tier). Untabulated results indicate that the proportion of entity-level versus application-level control deficiencies was statistically significant between Big 4 and second-tier firms ( $\chi^2 = 7.90$ ;  $p = 0.005$ ).

#### *4.2.1 Impact of firm size on classification of entity-level control deficiencies*

Next, we examine the impact of firm size on the type of entity-level control deficiencies classified according to paragraph 24 of Auditing Standard No. 5 (PCAOB, 2017a), with the results shown in Table 3. Of the 151 entity-level control deficiencies attributed to Big 4 firms, 48 (32%) involved centralized processing and controls, 38 (25%) related to controls over the period-end financial reporting process, 20 (13%) involved controls to monitor results of operations, and 22 (15%) related to controls to monitor other controls, including activities of the internal audit function, audit committee, and self-assessment programs. Interestingly, control deficiencies attributed to second-tier firms were concentrated in three categories: 46

(53%) deficiencies related to centralized processing and controls, 20 (23%) deficiencies involved controls over the period-end financial reporting process, and 10 (12%) deficiencies involved controls to monitor results of operations.

To examine differences in the type of entity-level control deficiencies between the Big 4 and second-tier firms, we performed chi-square tests of equality between proportions for the two groups (Big 4 versus second-tier). Untabulated results indicate that the differences in type of entity-level control deficiencies were not statistically significant between Big 4 and second-tier firms for entity-level control deficiencies ( $\chi^2 = 5.88$ ;  $p = 0.32$ ).

#### *4.2.2 Impact of firm size on classification of application-level deficiencies*

The classification of application-level control deficiencies for Big 4 firms is shown in Panels D, E, and F of Table 4 and for second-tier firms in Panels G, H, and I. A total of 439 accounts were identified by the PCAOB in their descriptions of the application-level control deficiencies for Big 4 firms and a total 167 accounts for second-tier firms. The three most common accounts did not vary by firm size, as most control deficiencies attributed to both Big 4 and second-tier firms involved revenue, inventory, and accounts receivable accounts. These trends are consistent with prior research (Church and Shefchik, 2012).

To compare differences in the accounts involved in application-level deficiencies between the Big 4 and second-tier firms, we performed chi-square tests (untabulated) of equality between two equal proportions for the two groups. The difference in the accounts involved between Big 4 and second-tier firms was not statistically significant ( $\chi^2 = 11.05$ ;  $p = 0.136$ ).



### *4.3 Impact of time on control deficiency reporting*

RQ3 asks whether the type of control audit deficiencies identified varies from inspection year 2010 to year 2015. Panels A to C of Table 5 present control deficiencies grouped by year for all firms. Panels D to F display the control deficiencies grouped by year for Big 4 firms, and Panels G to I present control deficiencies grouped by year for second-tier firms. For each set of panels, the first shows total number of deficiencies, the second displays deficiencies scaled by number of issuers with deficiencies, and the third presents deficiencies scaled by number of issuers inspected.

As shown in Table 5, Panel A, total control deficiencies varied significantly, from a low of 105 for inspection year 2010 to a high of 200 for inspection year 2013. Most of the difference in total annual control deficiency counts can be attributed to an increase in application-level deficiencies, from 69 for inspection year 2010 to 157 for inspection year 2013. Other than an increase in entity-level deficiencies from inspection year 2013 to 2014, entity-level deficiencies and ITGCs remained relatively constant.

#### *4.3.1 Impact of time on control deficiency reporting by firm size*

While the total number of control deficiencies identified varied somewhat for both Big 4 firms (see Panel D of Table 5) and second-tier firms (see Panel G of Table 5), untabulated results using chi-square tests of equal proportions indicate that the differences in proportions of total control deficiencies by year between Big 4 and second-tier firms were not statistically significant ( $\chi^2 = 6.56$ ;  $p = 0.255$ ). Interestingly, as shown Table 5, Panel D, the number of application-level control deficiencies found for Big 4 firms appears to have increased from inspection years 2010 to 2013 and then declined. Similarly, the number of application-level

control deficiencies for second-tier firms increased from inspection years 2010 to 2014 and then declined. This provides some evidence that the PCAOB is now identifying more internal control deficiencies than in the past (see discussion of Auditing Standard 13 in our subsection 2.4). Untabulated results using chi-square tests of equal proportions indicate that the differences in application-level control deficiencies by year between Big 4 and second-tier firms were statistically significant ( $\chi^2 = 17.13$ ;  $p = 0.004$ ). There may be several explanations for these differences, including that the PCAOB is concentrating its efforts on application-level controls, that audit firms are not concentrating their efforts on application-level controls, or that issuers in general are experiencing more application-level control challenges.

The number of entity-level deficiencies for both Big 4 and second-tier firms remained relatively steady except for a significant increase for Big 4 firms between inspection years 2013 and 2014. Untabulated results using chi-square tests of equal proportions indicate that the differences in entity-level control deficiencies by year between Big 4 and second-tier firms were not statistically significant ( $\chi^2 = 5.63$ ;  $p = 0.344$ ). Similarly, the number of ITGCs for both Big 4 and second-tier firms remained relatively steady. Untabulated results using chi-square tests of equal proportions indicate that the differences in ITGCs by year between Big 4 and second-tier firms were not statistically significant ( $\chi^2 = 6.09$ ;  $p = 0.297$ ).

[Insert Table 5 about here.]

#### *4.4 Additional analysis—impact of entity-level control deficiencies on issuers' financial statements*

As noted earlier, entity-level deficiencies may increase the probability of an adverse opinion on controls over the financial reporting process or the risk of material misstatement.

Additional untabulated analysis indicate that PCAOB inspectors explicitly noted that some

entity-level deficiencies affected issuers' financial statements. For Big 4 firms, the PCAOB found that deficiencies for four issuers audited by PwC and three issuers audited by EY resulted in issuers restating their financial statements after the preliminary PCAOB inspection process. Further, 11 entity-level deficiencies resulted in issuers audited by PwC revising their opinion on the effectiveness of their internal control over financial reporting to express an adverse opinion. Interestingly, four of these occurred in inspection year 2014 and six in inspection year 2015. For the second-tier firms, entity-level control deficiencies resulted in subsequent financial statement restatements for two issuers audited by BDO and two issuers audited by Grant Thornton.

## **5. Discussion and Conclusion**

### *5.1 Discussion*

Understanding how auditors evaluate internal controls and whether the PCAOB inspection process is satisfied with the current procedures used is important, as regulators, practitioners, and academics continue to stress the role of internal controls in corporate governance (DeFond and Lennox, 2017; Hoitash et al., 2009). This study uses text analysis to examine the *content* of PCAOB inspection reports regarding internal control deficiencies and reporting trends for the largest eight U.S. public accounting firms, grouped into Big 4 firms and second-tier firms. Specifically, the study examines PCAOB inspection reports and categorizes internal control deficiencies as either entity-level or application-level. These controls have differing impact on preventing and detecting material financial statement misstatements (Dickins and Fay, 2017). For example, entity-level control deficiencies may impact the internal control environment systemically and ultimately the quality of financial statements (Church and

Shefchik, 2012), thus auditors should perform additional testing. In contrast, application-level controls may introduce erroneous and/or fraudulent transactions into the system, but such risks generally do not affect all transactions or the system as a whole (PCAOB, 2007a). However, when auditors discover many application-level control deficiencies for one issuer, it may signal that entity-level controls, including ITGCs, are not operating effectively for that issuer. In a report on its inspections, the PCAOB (2008, 17) noted that auditors often did not test controls they relied on, failed to test controls sufficiently, or relied on ineffective controls. Thus, exploring internal control deficiencies including ITGCs is relevant to researchers, standard setters, and practitioners who work to improve audit quality.

After initially categorizing internal control deficiencies into entity-level versus application-level deficiencies, we further categorize the entity-level type deficiencies according to Auditing Standard No. 5 categories for entity-level internal control deficiencies (e.g., centralized IT processing, period-end financial reporting process, etc.) and subcategorize the application-level type deficiencies according to the account affected (e.g., accounts receivable, revenue, etc.). While Church and Shefchik (2012) examined application-level deficiencies, ours is the first study of which we are aware to isolate the Auditing Standard No. 5 categories of entity-level deficiencies. Such work provides an informational resource for both regulators and practitioners by highlighting the areas that pose the most common entity-level risks. With the entity-level and application-level deficiencies coded by type and subtype and for firm and year, we analyze whether control deficiencies differ statistically by audit firm size (Big 4 versus second-tier) or over time (across inspection years 2010 to 2015).

Our results show that the percentage of issuers with control deficiencies is higher for second-tier than for Big 4 firms, although there is no significant difference in the *number* of control deficiencies between Big 4 and second-tier firms on a weighted basis. This is not the case for application-level control deficiencies, however. The PCAOB identified significantly more application-level control deficiencies for Big 4 firms than for second-tier firms, and the difference between the number of entity-level and application-level control deficiencies is also statistically significant. This is not surprising, as application-level deficiencies occur at the transaction level while entity-level deficiencies occur across transactions.

In comparing application-level with entity-level control deficiencies, we note that the percentage of control deficiencies identified as application-level deficiencies is 75% for Big 4 firms and 66% for second-tier firms. Further, the number of application-level internal control deficiencies identified for Big 4 firms varies significantly between inspection years 2010 and 2015. The attention paid to application-level controls may be the result of recent risk assessment audit standard releases (i.e., Auditing Standard No. 12, Auditing Standard No. 13, and Auditing Standard No. 14). Indeed, these audit standards appear frequently in the reports for inspection years 2012 and 2013. Interestingly, the number of entity-level internal control deficiencies (including ITGCs) attributed by the PCAOB to both Big 4 and second-tier firms remained relatively flat from inspection years 2010 to 2015, although the percentage of entity-level control deficiencies for Big 4 and second-tier firms accounts for 25% and 34% of their total deficiencies, respectively. This finding suggests two potential trends. First, application-level control deficiencies continue to represent the majority of deficiencies for both firm types;

second, entity-level deficiencies are gaining in emphasis, if only from a percentage-of-total standpoint.

Our analysis of entity-level control deficiencies indicates that the PCAOB is focusing more on access controls over data, system resources, and IT tools. For example, the ability to change program logic, a failure to restrict programmer access to system resources, and unlimited access to computer resources are the most frequently noted deficiencies classified as involving centralized processing and controls. Similarly, the most frequently cited controls over the period-end financial reporting process are manual adjustments/journal entries, failure to coordinate financial close, and unlimited access to accounting system resources. Consistent with Church and Shefchik (2012), we note that deficiencies in revenue, inventory, and accounts receivable accounts are the most frequently cited under application-level controls for both Big 4 and second-tier firms, despite over a decade of inspections.

The effectiveness of application-level controls depends on ITGC such as access control and change management controls (PCAOB, 2013; Calderon et al., 2016). Further, recent practitioner articles note that auditors still struggle with evaluating ITGCs (Calderon et al., 2016; Lewczyk, 2016). Finally, a recent PCAOB Practice Alert identifies examples of auditors selecting ITGCs for testing, but failing to (1) test that the selected ITGCs are important to the effective operations of the applications that generated the data or reports, (2) test the query logic used to extract data from the IT applications used in the reports, or (3) address control deficiencies that were identified with respect to the ITGCs over either the applications that process the data used in the reports or the applications that generated the reports (PCAOB, 2013, 26). Taken

together, more research to examine the impact of ITGCs on clients' financial reporting systems is needed (Klamm and Watson, 2009; Wallace et al., 2011; Li et al., 2018).

Further, recent developments in information technology adopted by companies such as Blockchain would require the creation of new and complex ITGCs that might increase the risk of having more audit deficiencies in this area. Future research might look closer to the ITGCs environment to identify specific factors related to the creation and effectiveness of ITGCs like set of skills to be required for managers and auditors in charge of monitoring and assessing, the implementation of internal controls, respectively.

Taken together our findings show that PCAOB inspection reports remain focused mainly on application-level controls for Big 4 firms but have increased their focus on entity-level controls as well. Our findings may imply that audit firms need to better train their staff on how to identify and evaluate control deficiencies and to practice professional skepticism needed to avoid yielding to client management's assurances that internal controls have been properly tested. Furthermore, at present, IT audit specialists are not considered to be specialists per Audit Standard 1210, which states that auditors should have information technology skills (PCAOB, 2017c). Our findings, along with results from Jenkins et al. (2018), may suggest that the role of IT audit specialists in identifying control deficiencies should be increased and perhaps that the current standards need to be modified to consider IT specialists to be specialists.

## *5.2 Limitations*

As with all research, there are limitations to our study. First, our sample includes only six years of inspection reports for Big 4 and second-tier firms. Future research can examine PCAOB inspection reports for additional years. Second, we examine only the eight largest U.S. public

accounting firms. Whether our results will generalize to smaller firms or foreign firms remains an open question. Third, our analysis does not allow us to determine if Big 4 audit firms are not properly identifying internal control deficiencies, as evidenced by the differences in deficiencies across inspection years 2010 to 2015, or if the PCAOB inspectors are now better trained to identify such deficiencies (Johnson et al., 2017).<sup>10</sup>

### *5.3 Conclusion*

Given the risk-based emphasis of the PCAOB inspection process (Abernathy et al., 2013; Bhaskar 2017; Carson et al., 2017; Drake et al., 2017; Son et al., 2017), the PCAOB's inspection process may not perfectly identify all cases of internal control audit deficiencies. Future research into how to improve the PCAOB inspection process for identifying internal control deficiencies may be warranted. Some researchers suggest that auditors may focus on managing inspection outcomes by directing resources to areas they believe will be inspected rather than to those with a high risk of material misstatement (Boland et al., 2017; Glover et al., 2017; Glover and Prawitt, 2013; Houston and Stefaniak, 2013; Stefaniak et al., 2016). Whether our results suggesting that a greater concentration of application-level control deficiencies stems from auditors concentrating on detecting entity-level control problems due to their belief that the PCAOB is more likely to examine entity-level controls remains a subject for future research.

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<sup>10</sup> We note that the PCAOB budget for inspections has nearly doubled from \$68.8 million in fiscal year 2009 to \$124.4 million in fiscal year 2015 (Walworth and Hale, 2017). We were unable to determine whether the PCAOB increased their investment in training to identify internal control deficiencies during this time.



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**Table 1**

Summary information for inspection years 2010 to 2015—control deficiencies, other deficiencies, and total deficiencies.

## Panel A: All firms

	<u>Number of issuers inspected</u>	<u>Issuers with deficiencies</u>	<u>Issuers with deficiencies rate</u>	<u>Total control deficiencies</u>	<u>Percent<sup>a</sup></u>	<u>Total other deficiencies</u>	<u>Percent<sup>b</sup></u>	<u>Total deficiencies</u>
Total	1,836	703	38%	869	17%	4,339	83%	5,209

## Panel B: Big 4 firms

<u>Firm</u>	<u>Number of Issuers inspected</u>	<u>Issuers with deficiencies</u>	<u>Issuers with deficiencies rate</u>	<u>Total control deficiencies</u>	<u>Percent<sup>a</sup></u>	<u>Total other deficiencies</u>	<u>Percent<sup>b</sup></u>	<u>Total deficiencies</u>
Deloitte	318	100	31%	108	16%	567	84%	675
E&Y	335	122	36%	188	17%	927	83%	1,115
KPMG	297	108	36%	162	16%	842	84%	1,004
PwC	<u>358</u>	<u>134</u>	<u>37%</u>	<u>159</u>	<u>20%</u>	<u>648</u>	<u>80%</u>	<u>807</u>
Total	<u>1,308</u>	<u>464</u>	<u>35%</u>	<u>617</u>	<u>17%</u>	<u>2,984</u>	<u>83%</u>	<u>3,601</u>



**Table 1 (continued)**

Summary information for inspection years 2010 to 2015—control deficiencies, other deficiencies, and total deficiencies.

Panel C: Second-tier firms

<u>Firm</u>	<u>Number of issuers inspected</u>	<u>Issuers with deficiencies</u>	<u>Issuers with deficiencies rate</u>	<u>Total control deficiencies</u>	<u>Percent<sup>a</sup></u>	<u>Total other deficiencies</u>	<u>Percent<sup>b</sup></u>	<u>Total deficiencies</u>
BDO	142	70	49%	93	14%	569	86%	662
Crowe Horwath	79	35	44%	16	21%	59	79%	75
Grant Thornton	213	88	41%	110	19%	479	81%	589
RSM	<u>94</u>	<u>46</u>	<u>49%</u>	<u>34</u>	<u>12%</u>	<u>248</u>	<u>88%</u>	<u>282</u>
Total	<u>528</u>	<u>239</u>	<u>45%</u>	<u>253</u>	<u>16%</u>	<u>1355</u>	<u>84%</u>	<u>1,608</u>

<sup>a</sup> Total control deficiencies as a percentage of total deficiencies identified.<sup>b</sup> Total other deficiencies as a percentage of total deficiencies identified.

**Table 2**

Type of control deficiencies for inspection years 2010 to 2015.

## Panel A: Deficiencies for all firms unscaled

	<u>Entity</u>	<u>Percent<sup>a</sup></u>	<u>ITGC<sup>b</sup></u>	<u>Percent<sup>c</sup></u>	<u>Application</u>	<u>Percent<sup>d</sup></u>	<u>Total control deficiencies</u>
Total	237	27.4%	101	11.6%	632	72.6%	869

## Panel B: Deficiencies for all firms scaled by number of issuers with deficiencies

	<u>Entity</u>	<u>ITGC</u>	<u>Application</u>	<u>Total control deficiencies</u>
Total	0.34	0.14	0.90	1.24

## Panel C: Deficiencies for all firms scaled by number of issuers inspected

	<u>Entity</u>	<u>ITGC</u>	<u>Application</u>	<u>Total control deficiencies</u>
Total	0.13	0.06	0.34	0.47

<sup>a</sup> Total entity-level control deficiencies as a percentage of total control deficiencies identified.<sup>b</sup> ITGC refers to information technology general controls and represents a subset of entity-level control deficiencies.<sup>c</sup> Total ITGC deficiencies as a percentage of total control deficiencies identified.<sup>d</sup> Total application-level control deficiencies as a percentage of total control deficiencies identified.

**Table 2 (continued)**

Type of control deficiencies for inspection years 2010 to 2015.

## Panel D: Deficiencies for Big 4 firms unscaled

Firm	Entity	Percent <sup>a</sup>	ITGC <sup>b</sup>	Percent <sup>c</sup>	Application	Percent <sup>d</sup>	Total control deficiencies
Deloitte	14	13.0%	5	4.6%	94	87.0%	108
EY	44	23.5%	17	9.1%	143	76.5%	187
KPMG	45	27.8%	17	10.5%	117	72.2%	162
PwC	<u>48</u>	<u>30.2%</u>	<u>16</u>	<u>10.1%</u>	<u>111</u>	<u>69.8%</u>	<u>159</u>
Total	<u>151</u>	<u>24.5%</u>	<u>55</u>	<u>8.9%</u>	<u>465</u>	<u>75.5%</u>	<u>616</u>

## Panel E: Deficiencies for Big 4 firms scaled by number of issuers with deficiencies

Firm	Entity	ITGC	Application	Total control deficiencies
Deloitte	0.14	0.05	0.94	1.08
EY	0.36	0.14	1.17	1.53
KPMG	0.42	0.16	1.08	1.50
PwC	<u>0.36</u>	<u>0.12</u>	<u>0.83</u>	<u>1.19</u>
Total	<u>0.33</u>	<u>0.12</u>	<u>1.00</u>	<u>1.33</u>

## Panel F: Deficiencies for Big 4 firms scaled by number of issuers inspected

Firm	Entity	ITGC	Application	Total control deficiencies
Deloitte	0.04	0.02	0.30	0.34
EY	0.13	0.05	0.43	0.56
KPMG	0.15	0.06	0.39	0.55
PwC	<u>0.13</u>	<u>0.04</u>	<u>0.31</u>	<u>0.44</u>
Total	<u>0.12</u>	<u>0.04</u>	<u>0.36</u>	<u>0.47</u>

<sup>a</sup> Total entity-level control deficiencies as a percentage of total control deficiencies identified.<sup>b</sup> ITGC refers to information technology general controls and represents a subset of entity-level control deficiencies.<sup>c</sup> Total ITGC deficiencies as a percentage of total control deficiencies identified.<sup>d</sup> Total application-level control deficiencies as a percentage of total control deficiencies identified.

**Table 2 (continued)**

Type of control deficiencies for inspection years 2010 to 2015.

## Panel G: Deficiencies for second-tier firms unscaled

Firm	Entity	Percent <sup>a</sup>	ITGC <sup>b</sup>	Percent <sup>c</sup>	Application	Percent <sup>d</sup>	Total control deficiencies
BDO	25	26.9%	15	16.1%	68	73.1%	93
Crowe Horwath	12	75.0%	7	43.8%	4	25.0%	16
Grant Thornton	35	31.8%	17	15.5%	75	68.2%	110
RSM	<u>14</u>	<u>41.2%</u>	<u>7</u>	<u>20.6%</u>	<u>20</u>	<u>58.8%</u>	<u>34</u>
Total	<u>86</u>	<u>34.0%</u>	<u>46</u>	<u>18.2%</u>	<u>167</u>	<u>66.0%</u>	<u>253</u>

## Panel H: Deficiencies for second-tier firms scaled by number of issuers with deficiencies

Firm	Entity	ITGC	Application	Total control deficiencies
BDO	0.36	0.21	0.97	1.33
Crowe Horwath	0.34	0.20	0.11	0.46
Grant Thornton	0.40	0.19	0.85	1.25
RSM	<u>0.30</u>	<u>0.15</u>	<u>0.43</u>	<u>0.74</u>
Total	<u>0.36</u>	<u>0.19</u>	<u>0.70</u>	<u>1.06</u>

## Panel I: Deficiencies for second-tier firms scaled by number of issuers inspected

Firm	Entity	ITGC	Application	Total control deficiencies
BDO	0.18	0.11	0.48	0.65
Crowe Horwath	0.15	0.09	0.05	0.20
Grant Thornton	0.16	0.08	0.35	0.52
RSM	<u>0.12</u>	<u>0.06</u>	<u>0.17</u>	<u>0.29</u>
Total	<u>0.16</u>	<u>0.08</u>	<u>0.30</u>	<u>0.46</u>

<sup>a</sup> Total entity-level control deficiencies as a percentage of total control deficiencies identified.<sup>b</sup> ITGC refers to information technology general controls and represents a subset of entity-level control deficiencies.<sup>c</sup> Total ITGC deficiencies as a percentage of total control deficiencies identified.<sup>d</sup> Total application-level control deficiencies as a percentage of total control deficiencies identified.

**Table 3**

Entity-level control deficiencies by firm and category for inspection years 2010 to 2015.

Firm	Centralized processing and controls, including shared service environments <sup>a</sup>	Controls over period-end financial reporting process	Controls to monitor results of operations	Controls to monitor other controls, including activities of internal audit function, audit committee, and self-assessment programs	Controls related to control environment	Controls over management override	Policies addressing significant business control and risk management practices	Company's risk assessment process	Total
<i>Big 4</i>									
Deloitte	5	1	3	2	2	0	1	0	14
EY	10	18	7	6	3	0	0	0	44
KPMG	17	9	4	6	5	4	0	0	45
PwC	<u>16</u>	<u>10</u>	<u>6</u>	<u>8</u>	<u>7</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>48</u>
Total	<u>48</u>	<u>38</u>	<u>20</u>	<u>22</u>	<u>17</u>	<u>5</u>	<u>1</u>	<u>0</u>	<u>151</u>
<i>Second-tier</i>									
BDO	15	5	2	2	0	0	1	0	25
Crowe Horwath	7	3	2	0	0	0	0	0	12
Grant Thornton	17	8	4	2	3	1	0	0	35
RSM	<u>7</u>	<u>4</u>	<u>2</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>14</u>
Total	<u>46</u>	<u>20</u>	<u>10</u>	<u>4</u>	<u>4</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>86</u>
Total all firms	<u>94</u>	<u>58</u>	<u>30</u>	<u>26</u>	<u>21</u>	<u>6</u>	<u>2</u>	<u>0</u>	<u>237</u>

<sup>a</sup> Entity-level control deficiencies related to ITGCs include 94 controls related to the category of "Centralized processing and controls, including shared service environments" as well as 7 controls categorized as "Controls over period-end financial reporting process". This resulted in a count of 101 ITGCs deficiencies overall as reported in Panel A of Table 2.

**Table 4**

Application-level control deficiencies by account affected for inspection years 2010 to 2015.

## Panel A: Deficiencies for all firms unscaled

	<u>Revenue</u>	<u>A/R</u>	<u>Inventory</u>	<u>Investments</u>	<u>Loans (assets)</u>	<u>Goodwill</u>	<u>Other assets</u>	<u>Liabilities</u>	<u>Total</u> <sup>a</sup>
Total all firms	174	101	117	71	28	46	61	8	606

## Panel B: Deficiencies for all firms scaled by number of issuers with deficiencies

	<u>Revenue</u>	<u>A/R</u>	<u>Inventory</u>	<u>Investments</u>	<u>Loans (assets)</u>	<u>Goodwill</u>	<u>Other assets</u>	<u>Liabilities</u>	<u>Total</u>
Total all firms	0.25	0.14	0.17	0.10	0.04	0.07	0.09	0.01	0.86

## Panel C: Deficiencies for all firms scaled by number of issuers inspected

	<u>Revenue</u>	<u>A/R</u>	<u>Inventory</u>	<u>Investments</u>	<u>Loans (assets)</u>	<u>Goodwill</u>	<u>Other assets</u>	<u>Liabilities</u>	<u>Total</u>
Total all firms	0.09	0.05	0.06	0.04	0.02	0.02	0.03	0.00	0.33

<sup>a</sup> Total of application-level deficiencies does not match total shown in Table 2, Panel A, given that some deficiencies did not fall under the above account categories.

**Table 4 (continued)**

Application-level control deficiencies by account affected for inspection years 2010 to 2015.

## Panel D: Deficiencies for Big 4 firms unscaled

Firm	Revenue	A/R	Inventory	Investments	Loans (assets)	Goodwill	Other Assets	Liabilities	Total <sup>b</sup>
Deloitte	20	5	20	14	7	10	11	5	92
EY	41	19	30	14	1	11	15	1	132
KPMG	27	29	15	19	13	0	11	1	115
PwC	<u>30</u>	<u>18</u>	<u>19</u>	<u>6</u>	<u>2</u>	<u>10</u>	<u>14</u>	<u>1</u>	<u>100</u>
Total	<u>118</u>	<u>71</u>	<u>84</u>	<u>53</u>	<u>23</u>	<u>31</u>	<u>51</u>	<u>8</u>	<u>439</u>

## Panel E: Deficiencies for Big 4 firms scaled by number of issuers with deficiencies

Firm	Revenue	A/R	Inventory	Investments	Loans (assets)	Goodwill	Other Assets	Liabilities	Total
Deloitte	0.20	0.05	0.20	0.14	0.07	0.10	0.11	0.05	0.92
EY	0.34	0.16	0.25	0.11	0.01	0.09	0.12	0.01	1.08
KPMG	0.25	0.27	0.14	0.18	0.12	—	0.10	0.01	1.06
PwC	<u>0.22</u>	<u>0.13</u>	<u>0.14</u>	<u>0.04</u>	<u>0.01</u>	<u>0.07</u>	<u>0.10</u>	<u>0.01</u>	<u>0.75</u>
Total	<u>0.25</u>	<u>0.15</u>	<u>0.18</u>	<u>0.11</u>	<u>0.05</u>	<u>0.07</u>	<u>0.11</u>	<u>0.02</u>	<u>0.95</u>

## Panel F: Deficiencies for Big 4 firms scaled by number of issuers inspected

Firm	Revenue	A/R	Inventory	Investments	Loans (assets)	Goodwill	Other Assets	Liabilities	Total
Deloitte	0.06	0.02	0.06	0.04	0.02	0.03	0.03	0.02	0.29
EY	0.12	0.06	0.09	0.04	0.00	0.03	0.04	0.00	0.39
KPMG	0.09	0.10	0.05	0.06	0.04	—	0.04	0.00	0.39
PwC	<u>0.08</u>	<u>0.05</u>	<u>0.05</u>	<u>0.02</u>	<u>0.01</u>	<u>0.03</u>	<u>0.04</u>	<u>0.00</u>	<u>0.28</u>
Total	<u>0.09</u>	<u>0.05</u>	<u>0.06</u>	<u>0.04</u>	<u>0.02</u>	<u>0.02</u>	<u>0.04</u>	<u>0.01</u>	<u>0.34</u>

<sup>b</sup> Total of Big 4 deficiencies does not match total shown in Table 2, Panel D, given that some deficiencies did not fall under the above account categories.

**Table 4 (continued)**

Application-level control deficiencies by account affected for inspection years 2010 to 2015.

## Panel G: Deficiencies for second-tier firms unscaled

<u>Firm</u>	<u>Revenue</u>	<u>A/R</u>	<u>Inventory</u>	<u>Investments</u>	<u>Loans (assets)</u>	<u>Goodwill</u>	<u>Other Assets</u>	<u>Liabilities</u>	<u>Total<sup>c</sup></u>
BDO	21	9	20	10	1	4	3	0	68
Crowe Horwath	0	2	0	0	1	0	1	0	4
Grant Thornton	31	14	10	6	0	11	3	0	75
RSM	<u>4</u>	<u>5</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>0</u>	<u>3</u>	<u>0</u>	<u>20</u>
Total	<u>56</u>	<u>30</u>	<u>33</u>	<u>18</u>	<u>5</u>	<u>15</u>	<u>10</u>	<u>0</u>	<u>167</u>

## Panel H: Deficiencies for second-tier firms scaled by number of Issuers with deficiencies

<u>Firm</u>	<u>Revenue</u>	<u>A/R</u>	<u>Inventory</u>	<u>Investments</u>	<u>Loans (assets)</u>	<u>Goodwill</u>	<u>Other Assets</u>	<u>Liabilities</u>	<u>Total</u>
BDO	0.30	0.13	0.29	0.14	0.01	0.06	0.04	—	0.97
Crowe Horwath	—	0.06	—	—	0.03	—	0.03	—	0.11
Grant Thornton	0.35	0.16	0.11	0.07	—	0.13	0.03	—	0.85
RSM	<u>0.09</u>	<u>0.11</u>	<u>0.07</u>	<u>0.04</u>	<u>0.07</u>	<u>—</u>	<u>0.07</u>	<u>—</u>	<u>0.43</u>
Total	<u>0.23</u>	<u>0.13</u>	<u>0.14</u>	<u>0.08</u>	<u>0.02</u>	<u>0.06</u>	<u>0.04</u>	<u>—</u>	<u>0.70</u>

## Panel I: Deficiencies for second-tier firms scaled by number of issuers inspected

<u>Firm</u>	<u>Revenue</u>	<u>A/R</u>	<u>Inventory</u>	<u>Investments</u>	<u>Loans (assets)</u>	<u>Goodwill</u>	<u>Other Assets</u>	<u>Liabilities</u>	<u>Total</u>
BDO	0.15	0.06	0.14	0.07	0.01	0.03	0.02	—	0.48
Crowe Horwath	—	0.03	—	—	0.01	—	0.01	—	0.05
Grant Thornton	0.15	0.07	0.05	0.03	—	0.05	0.01	—	0.35
RSM	<u>0.03</u>	<u>0.04</u>	<u>0.03</u>	<u>0.02</u>	<u>0.03</u>	<u>—</u>	<u>0.03</u>	<u>—</u>	<u>0.21</u>
Total	<u>0.10</u>	<u>0.05</u>	<u>0.06</u>	<u>0.03</u>	<u>0.01</u>	<u>0.03</u>	<u>0.02</u>	<u>—</u>	<u>0.32</u>

<sup>c</sup> Total of second-tier deficiencies does not match total shown in Table 2, Panel G, given that some deficiencies did not fall under the above account categories.



**TABLE 5**

Trends in control deficiencies reporting.

## Panel A: Deficiencies for all firms unscaled

Inspection year <sup>a</sup>	Entity	Percent <sup>b</sup>	ITGC <sup>c</sup>	Percent <sup>d</sup>	Application	Percent <sup>e</sup>	Total control deficiencies	Percent
2010	36	34.3%	15	14.3%	69	65.7%	105	100%
2011	36	25.2%	13	9.1%	107	74.8%	143	100%
2012	34	25.4%	14	10.4%	100	74.6%	134	100%
2013	43	21.5%	25	12.5%	157	78.5%	200	100%
2014	59	33.7%	21	12.0%	116	66.3%	175	100%
2015	<u>29</u>	<u>25.9%</u>	<u>13</u>	<u>11.6%</u>	<u>83</u>	<u>74.1%</u>	<u>112</u>	<u>100%</u>
Total	<u>237</u>	<u>27.3%</u>	<u>101</u>	<u>11.6%</u>	<u>632</u>	<u>72.7%</u>	<u>869</u>	<u>100%</u>

## Panel B: Deficiencies for all firms scaled by number of issuers with deficiencies

Inspection year	Entity	ITGC	Application	Total control deficiencies
2010	0.31	0.13	0.58	0.89
2011	0.30	0.11	0.89	1.19
2012	0.27	0.11	0.79	1.06
2013	0.34	0.20	1.24	1.57
2014	0.50	0.18	0.97	1.47
2015	<u>0.32</u>	<u>0.14</u>	<u>0.90</u>	<u>1.22</u>
Total	<u>0.34</u>	<u>0.14</u>	<u>0.90</u>	<u>1.24</u>

## Panel C: Deficiencies for all firms scaled by number of issuers inspected

Inspection year	Entity	ITGC	Application	Total control deficiencies
2010	0.10	0.04	0.20	0.30
2011	0.12	0.04	0.35	0.47
2012	0.12	0.05	0.34	0.46
2013	0.15	0.09	0.54	0.68
2014	0.20	0.07	0.39	0.58
2015	<u>0.10</u>	<u>0.04</u>	<u>0.28</u>	<u>0.38</u>
Total	<u>0.13</u>	<u>0.06</u>	<u>0.34</u>	<u>0.47</u>

<sup>a</sup> PCAOB inspection year. Each report was publicly issued one year later. For example, the 2010 inspection year report was made public in 2011.

<sup>b</sup> Total entity-level control deficiencies as a percentage of total control deficiencies identified.

<sup>c</sup> ITGC refers to information technology general controls.

<sup>d</sup> Total ITGC deficiencies as a percentage of total control deficiencies identified.

<sup>e</sup> Total application-level control deficiencies as a percentage of total control deficiencies identified.

**TABLE 5 (continued)**

Trends in control deficiencies reporting.

## Panel D: Deficiencies for Big 4 firms unscaled

Inspection year <sup>a</sup>	Entity	Percent <sup>b</sup>	ITGC <sup>c</sup>	Percent <sup>d</sup>	Application	Percent <sup>e</sup>	Total control deficiencies	Percent
2010	22	27.8%	5	6.3%	57	72.2%	79	100%
2011	22	22.4%	6	6.1%	76	77.6%	98	100%
2012	20	20.4%	8	8.2%	78	79.6%	98	100%
2013	24	16.2%	15	10.1%	124	83.8%	148	100%
2014	43	38.1%	11	9.7%	70	61.9%	113	100%
2015	<u>20</u>	<u>25.0%</u>	<u>10</u>	<u>12.5%</u>	<u>60</u>	<u>75.0%</u>	<u>80</u>	<u>100%</u>
Total	<u>151</u>	<u>24.5%</u>	<u>55</u>	<u>8.9%</u>	<u>465</u>	<u>75.5%</u>	<u>616</u>	<u>100%</u>

## Panel E: Deficiencies for Big 4 firms scaled by number of issuers with deficiencies

Inspection year	Entity	ITGC	Application	Total control deficiencies
2010	0.31	0.07	0.79	1.10
2011	0.28	0.08	0.95	1.23
2012	0.25	0.10	0.96	1.21
2013	0.26	0.16	1.32	1.57
2014	0.57	0.14	0.92	1.49
2015	<u>0.33</u>	<u>0.16</u>	<u>0.98</u>	<u>1.31</u>
Total	<u>0.33</u>	<u>0.12</u>	<u>1.00</u>	<u>1.33</u>

## Panel F: Deficiencies for Big 4 firms scaled by number of inspected firms

Inspection year	Entity	ITGC	Application	Total control deficiencies
2010	0.09	0.02	0.24	0.33
2011	0.10	0.03	0.35	0.45
2012	0.10	0.04	0.37	0.47
2013	0.11	0.07	0.59	0.70
2014	0.20	0.05	0.32	0.52
2015	<u>0.09</u>	<u>0.05</u>	<u>0.28</u>	<u>0.38</u>
Total	<u>0.12</u>	<u>0.04</u>	<u>0.36</u>	<u>0.47</u>

<sup>a</sup> PCAOB inspection year. Each report was publicly issued one year later. For example, the 2010 inspection year report was made public in 2011.

<sup>b</sup> Total entity-level control deficiencies as a percentage of total control deficiencies identified.

<sup>c</sup> ITGC refers to information technology general controls.

<sup>d</sup> Total ITGC deficiencies as a percentage of total control deficiencies identified.

<sup>e</sup> Total application-level control deficiencies as a percentage of total control deficiencies identified.

**Table 5 (continued)**

Trends in control deficiencies reporting.

Panel G: Deficiencies for second-tier firms unscaled

Inspection year <sup>a</sup>	Entity	Percent <sup>b</sup>	ITGC <sup>c</sup>	Percent <sup>d</sup>	Application	Percent <sup>e</sup>	Total control deficiencies	Percent
2010	14	53.8%	10	38.5%	12	46.2%	26	100%
2011	14	31.1%	7	15.6%	31	68.9%	45	100%
2012	14	38.9%	6	16.7%	22	61.1%	36	100%
2013	19	36.5%	10	19.2%	33	63.5%	52	100%
2014	16	25.8%	10	16.1%	46	74.2%	62	100%
2015	9	28.1%	3	9.4%	23	71.9%	32	100%
Total	86	34.0%	46	18.2%	167	66.0%	253	100%

Panel H: Deficiencies for second-tier firms scaled by number of issuers with deficiencies

Inspection year	Entity	ITGC	Application	Total control deficiencies
2010	0.30	0.22	0.26	0.57
2011	0.35	0.18	0.78	1.13
2012	0.30	0.13	0.48	0.78
2013	0.58	0.30	1.00	1.58
2014	0.37	0.23	1.07	1.44
2015	0.29	0.10	0.74	1.03
Total	0.36	0.19	0.70	1.06

Panel I: Deficiencies for second-tier firms scaled by number of issuers inspected firms

Inspection year	Entity	ITGC	Application	Total control deficiencies
2010	0.11	0.08	0.10	0.21
2011	0.16	0.08	0.36	0.52
2012	0.17	0.07	0.27	0.43
2013	0.23	0.12	0.40	0.63
2014	0.19	0.12	0.54	0.73
2015	0.10	0.03	0.27	0.37
Total	0.16	0.08	0.30	0.46

<sup>a</sup> PCAOB inspection year. Each report was publicly issued one year later. For example, the 2010 inspection year report was made public in 2011.

<sup>b</sup> Total entity-level control deficiencies as a percentage of total control deficiencies identified.

<sup>c</sup> ITGC refers to information technology general controls.

<sup>d</sup> Total ITGC deficiencies as a percentage of total control deficiencies identified.

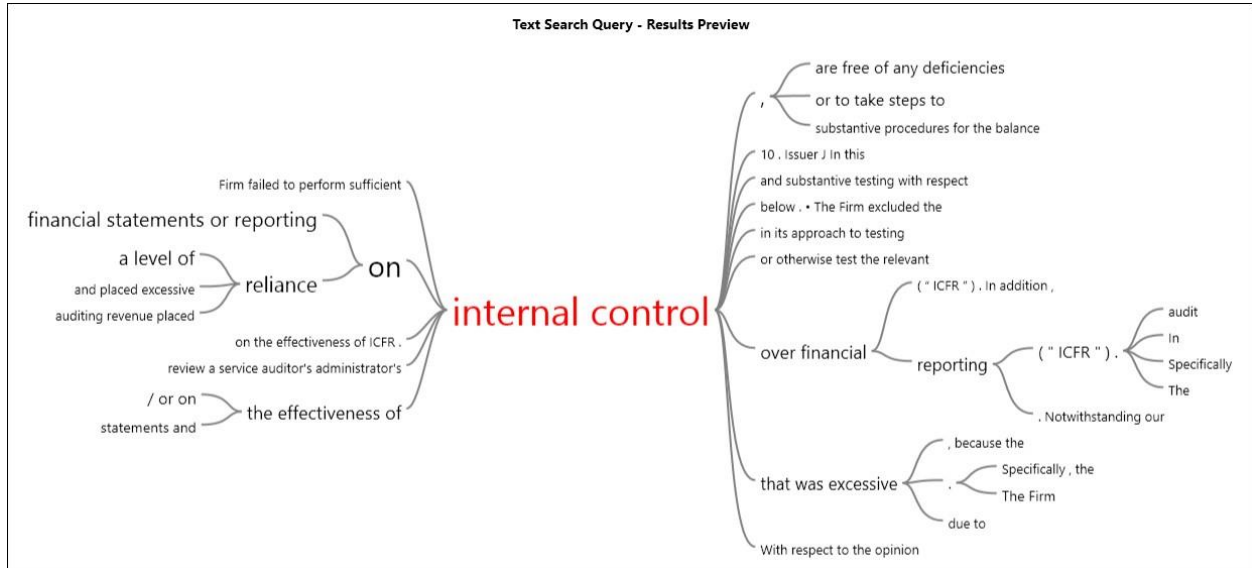
<sup>e</sup> Total application-level control deficiencies as a percentage of total control deficiencies identified.



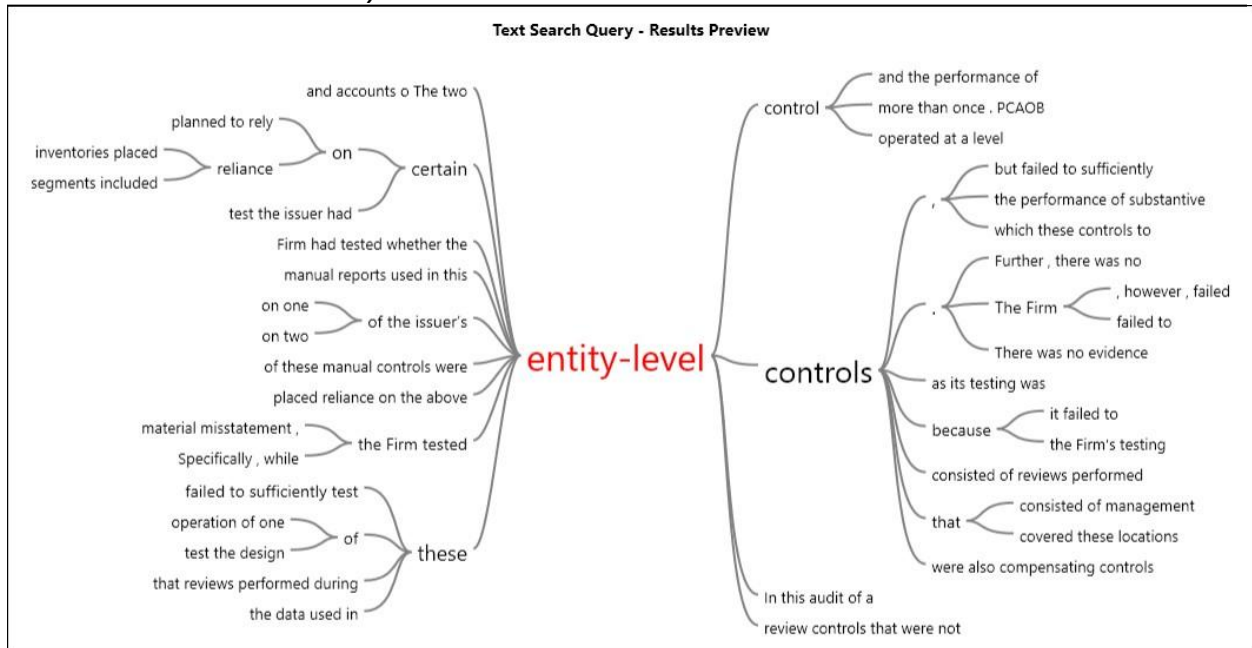
Figure 2

Word trees based on NVivo text search queries

Panel A: Word tree for *internal control*

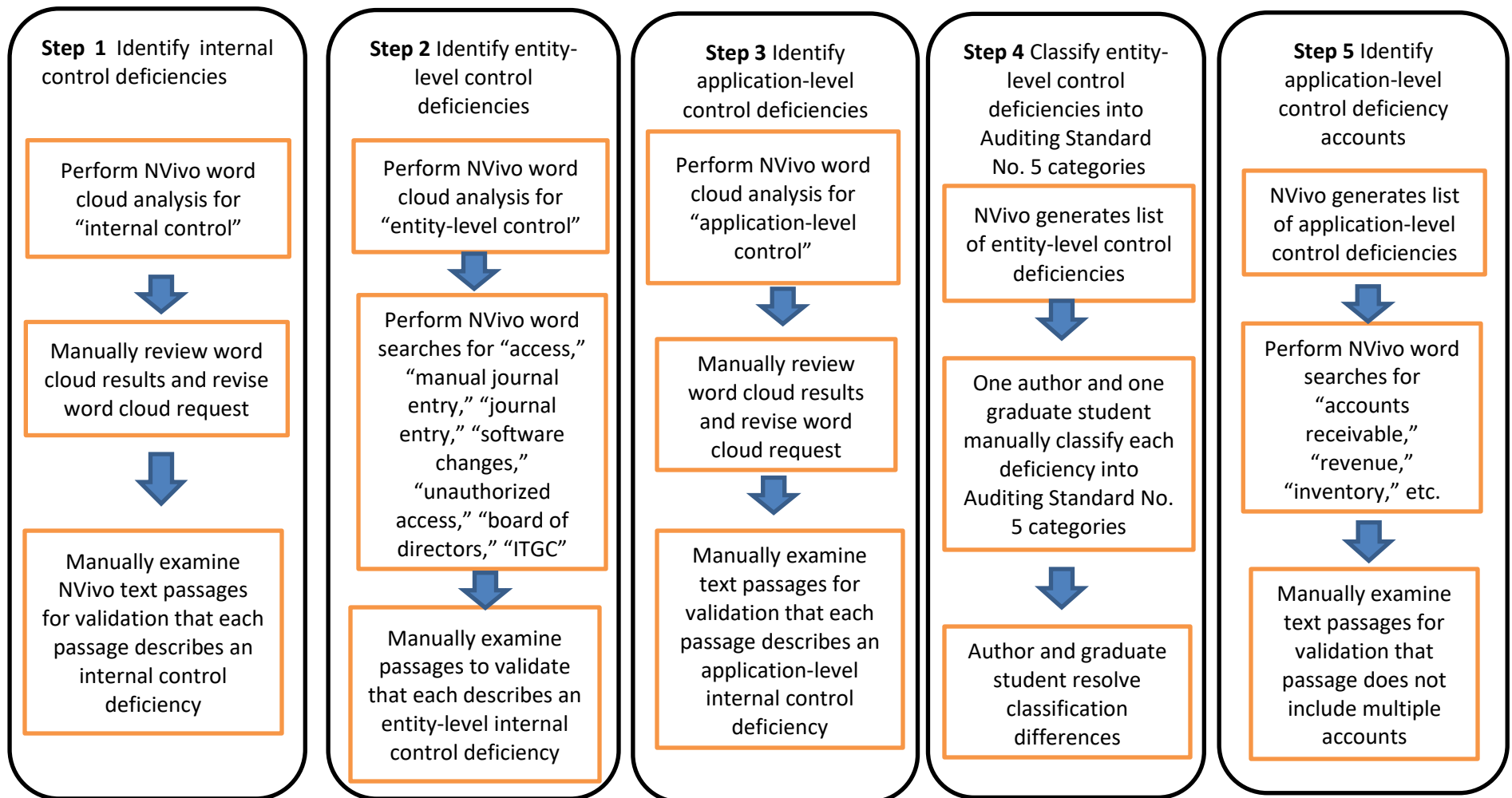


Panel B: Word tree for *entity-level*



**Exhibit 1**

Panel A: Step diagram of the text analysis process using NVivo



## Exhibit 1 (continued)

### Panel B: Steps in text analysis using NVivo

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#### Step 1 Identify internal control deficiencies

Performed word cloud analysis on the PCAOB inspection reports

- A. Based on output, identified text associated with the term “internal control”
- B. Examined the text passage manually for validation of NVivo results (e.g.:  
Were any issues surrounding internal control omitted from NVivo results?)

#### Step 2 Identify entity-level control deficiencies

Performed word cloud analysis for “entity-level” control deficiencies

- A. Using text search, identified control deficiencies associated with entity-level issues.
- B. Performed a word cloud analysis to identify the most common terms associated with entity-level control deficiencies.
- C. Selected search terms applicable to entity-level controls using NVivo based on the word cloud analysis. Terms included “manual journal entries,” “ITGC,” and “computer access.”
- D. Examined the underlying text passage for classification verification.

#### Step 3 Identify application-level control deficiencies

Performed word cloud analysis for “application-level” control deficiencies

- A. Using text search, identified control deficiencies associated with application-level issues.
- B. Performed a word cloud analysis to identify the most common terms associated with application-level control deficiencies.
- C. Selected search terms applicable to application-level controls using NVivo based on the word cloud analysis. Terms included “revenue,” “inventory,” “accounts receivable.”
- D. Examined the underlying text passage for classification verification.

#### Step 4 Classify entity-level control deficiencies into Auditing Standard No. 5 categories

Using the entity-level control deficiencies identified in Step 2, one coauthor and one graduate assistant classified each entity-level control deficiency into one of seven Auditing Standard No. 5 categories.

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## Exhibit 1 (continued)

### Panel B: Steps in text search process using NVivo

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#### **Step 5** Identify application-level control deficiency accounts

Using application-level control deficiencies identified in Step 3 and output from word cloud analysis, entered the most common account names (top 10) into the text search in NVivo.

- A. Based on the word cloud results, determined that between 7 to 10 accounts appeared on a consistent basis and limited our further search to these accounts.
  - B. Based on the text search output for the common accounts mentioned in the PCAOB document, examined the underlying text and classified the control deficiency according to the scheme mentioned previously. Applied judgment as to whether the control deficiency was so pervasive, meaning it affected multiple accounts (e.g., revenue, accounts receivable, inventory, etc.) that it warranted reclassification as an entity-level deficiency.
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## Exhibit 2

### Selected comments from PCAOB inspection reports

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#### Panel A: Entity-level control deficiencies

"The Firm identified and tested a total of three controls over revenue. One of the controls consisted of the issuer's comparison of the terms in customer purchase orders to the terms for those orders entered into the issuer's accounting system. The other two controls were automated information technology ("IT") controls designed to (1) compare prices to a master price list and suspend the processing of orders with pricing differences over certain thresholds and (2) generate customer invoices and record product sales at the time products were shipped. The Firm failed to identify that the controls it selected and tested were not designed to address, and it did not identify and test any other controls that addressed, the accuracy of (1) the master price list used in the first IT control and (2) the quantities used in the second IT control that were included in the invoices and used to record product sales. (AS No. 5, paragraph 39)" (PCAOB; Deloitte 2016 report date, Issuer H) (2015 inspection year)

"The Firm failed to test journal entries recorded at the issuer's individual locations, despite ineffective controls over access to the locations' general ledger systems, fraud at the locations, and a significant volume of journal entries processed at the locations." (PCAOB; EY 2012 report date, Issuer A) (2011 inspection year)

"The issuer's period-end financial reporting process was decentralized and included manual activities at the various locations. The Firm identified deficiencies related to controls over journal entries at the locations involved in the period-end financial ledger during the reporting process. The Firm also determined that large numbers of personnel had the ability to modify general records related to the period-end financial reporting process. The Firm failed to perform sufficient testing of certain controls related to the period-end financial reporting process." (PCAOB; EY 2012 report date, Issuer B) (2011 inspection year)

"While the Firm identified and tested controls that addressed the risks associated with the fact that certain users could access all programs and data without first needing to access an application, its testing did not address the risk that the issuer had granted other users similar access to some, but not all, programs and data without first needing to access an application." (PCAOB; KPMG 2012 report date, Issuer F) (2011 inspection year)

"The issuer's policy allowed for certain members of senior management both to request and to approve access to significant financial applications, and also to perform the annual review of user access to these applications. In addition, the issuer's general ledger application was set up in a way that could allow users to circumvent user-access controls to make changes to the data in the general ledger. There was no evidence in the audit documentation, and no persuasive other evidence, that the Firm had identified the risks associated with either of these circumstances or had tested controls that addressed these risks." (PCAOB; KPMG 2012 report date, Issuer F) (2011 inspection year)

## Exhibit 2 (continued)

### Selected comments from PCAOB inspection reports

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#### Panel A: Entity-level control deficiencies (continued)

"In addition, the Firm identified a specific risk of fraudulent journal entries, but failed to include journal entries recorded in the general ledgers of these units in its population of journal entries subject to testing." (PCAOB; PwC 2012 report date, Issuer O) (2011 inspection year)

"The issuer engaged an external party ("the consultants") to perform its testing of controls. The Firm used the work of the consultants as evidence of the operating effectiveness of controls for almost all of the controls that the Firm considered to be of low and medium risk and that the Firm selected for testing. The Firm's use of the work of the consultants was excessive because the Firm's testing of the consultants' work was limited to reperformance for a small percentage of the controls, even though the Firm had information indicating that the consultants might have a low level of objectivity because they were engaged by the issuer's management and reported directly to the control owner for some of the controls they tested. (AU 322, paragraphs .10, .24, and .26)" (PCAOB; PwC 2016 report date, Issuer B) (2015 inspection year)

"The Firm failed to evaluate whether various misstatements and exceptions that it identified in its testing resulted from control deficiencies. (AS No. 5, paragraphs 48 and B8)" (PCAOB; BDO report date 2013, Issuer A) (2012 inspection year)

"In this audit, the Firm failed to obtain sufficient appropriate audit evidence to support its audit opinion on the effectiveness of internal controls over financial reporting (ICFR), as its procedures to test the operating effectiveness of controls over the occurrence of revenue were insufficient. Specifically, for one of the two controls tested, the Firm's procedures were limited to observing an electronic stamp as evidence that the control had operated. The Firm, however, failed to test whether any of the actions required by the control had been performed. (AS No. 5, paragraph 44)" (PCAOB; Crowe Horwath LLP report date 2016, Issuer B) (2015 inspection year)

"The Firm failed to perform sufficient procedures to test information technology general controls ("ITGCs"). Specifically, with respect to certain important financial applications, the Firm failed to test the ITGCs over the databases and operating systems supporting them, test whether the issuer had appropriate segregation of duties over program changes, test whether the population used for testing program changes was complete, and test certain controls that the Firm had identified as compensating controls for an ITGC deficiency." (PCAOB; Grant Thornton report date 2012, Issuer A) (2010 inspection year)

"The Firm failed to perform sufficient procedures to test controls over the accuracy and completeness of system-generated reports used in the performance of management's review controls. Specifically, the Firm failed to test security access controls over the database supporting the application that generated those reports or perform other procedures to test related internal controls. (AS No. 5, paragraph 39)" (PCAOB; RSM report date 2014, Issuer C) (2013 inspection year)

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## Exhibit 2 (continued)

Selected comments from PCAOB inspection reports

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### Panel B: Application-level control deficiencies

“The Firm designed its substantive procedures – including sample sizes and, in the performance of substantive analytical procedures for one location, thresholds for investigation of differences from expectations – to test the valuation of certain inventory based on a level of control reliance that was not supported due to the deficiencies in the Firm's testing of controls that are discussed above. As a result, certain of the sample sizes the Firm used to test the valuation of this inventory were too small to provide sufficient evidence, and certain of the thresholds for further investigation were too high. (AS No. 13, paragraphs 16, 18, and 37; AU 329, paragraph .20; AU 350, paragraphs .19 and .23)” (PCAOB; Deloitte report date 2014, Issuer E) (2013 inspection year)

“For the issuer's domestic locations, the Firm failed to perform sufficient procedures related to certain inventory. Specifically, the Firm selected for testing certain controls that consisted of the review of standard costs (including burden rates), variances, and inventory balances; however, the Firm's procedures to test these controls were insufficient. Specifically, the Firm's procedures were limited to inquiring of management, inspecting emails that indicated certain reviews had occurred, and comparing certain amounts to supporting documents and/or the general ledger. The Firm failed to test whether the controls operated at a level of precision that would prevent or detect material misstatements, as it failed to ascertain, and evaluate, (1) the nature of the review activities performed, (2) the criteria used to identify items for follow up, and (3) how those items were resolved. In addition, the Firm failed to identify and test any controls over the accuracy and completeness of reports that the issuer used in the performance of certain of these controls. Further, although the controls that the Firm tested addressed aspects of the capitalization rates used, the Firm failed to test any controls that addressed whether the types of labor and overhead costs that were included in inventory were appropriately capitalized. (AS No. 5, paragraphs 39, 42, and 44)” (PCAOB; EY report date 2015, Issuer C) (2014 inspection year)

“The Firm's primary procedure to test revenue was to develop an independent expectation of total revenue for the year based on cash receipts for the year and changes in the balances for accounts receivable, relevant reserves, and deferred revenue from the beginning to the end of the year. The Firm failed to develop an appropriate expectation since, as noted below, the Firm failed to sufficiently test accounts receivable that it used in developing the expectation. While the Firm did perform other testing of a sample of individual revenue transactions, the sample size for this testing was too small, because the Firm placed unwarranted reliance on its primary procedure.” (PCAOB; KPMG report date 2013, Issuer A) (2012 inspection year)

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## Exhibit 2 (continued)

### Selected comments from inspection reports

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#### Panel B: Application-level control deficiencies (continued)

“The Firm failed to perform procedures, beyond inquiry of management, to test whether the issuer's inventory was valued at the lower of its cost or market. In addition, the Firm failed to identify and test any controls over the issuer's valuation of its inventory at the lower of its cost or market. (AS No. 5, paragraph 39; AS No. 12, paragraphs 4, 5, and 7; AS No. 13, paragraph 8)” (PCAOB; PwC report date 2014, Issuer F) (2013 inspection year)

“The Firm failed to perform sufficient procedures to test controls over revenue. Specifically, the Firm's testing of certain controls over revenue and accounts receivable was insufficient, as the Firm limited its testing to observing sign-offs as evidence that reviews that constituted part or all of the controls had occurred, without evaluating whether these controls operated at a level of precision that would prevent or detect material misstatements. In addition, the Firm failed to identify and test any controls over the accuracy and completeness of data and reports used in (1) performing these controls or (2) determining the amount of revenue recognized at one of the subsidiaries. (AS No. 5, paragraphs 39, 42, and 44)” (PCAOB; BDO report date 2014, Issuer D) (2013 inspection year)

“The Firm failed to perform sufficient procedures to test the completeness and existence of loans acquired and deposits combinations at the date of acquisition. The Firm compared the acquired assumed in the business loans and assumed deposits trial balances as of the acquisition dates to supporting schedules provided by the issuer and confirmed a sample of acquired loans and assumed deposits as of an interim date approximately three months and ten months subsequent to the respective acquisition dates. During the year, but prior to the Firm's interim testing, the issuer converted the loan and deposits applications acquired in the business combinations to the issuer's core loan and deposits application. The Firm, however, failed to perform procedures to roll-back its interim confirmation procedures over loans and deposits that included the loans acquired and deposits assumed in the business combinations to the respective acquisition dates in testing the completeness and existence of those balances as of the acquisition dates. (AS No. 13, paragraph 8)” (PCAOB; Crowe Horwath 2015 report date, Issuer E) (2014 inspection year)

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## Exhibit 2 (continued)

Selected comments from inspection reports

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### Panel B: Application-level control deficiencies (continued)

“The Firm failed to perform sufficient procedures to test three controls over the Allowance for Loan Losses (ALL) that it selected. These controls consisted of (1) a management committee's review of reports used in the ALL calculation, (2) the Chief Financial Officer's ("CFO") review of the ALL calculation, and (3) the issuer's Board of Director's review and approval of the ALL calculation. The Firm's procedures to test these controls were limited to (1) inquiring of certain of the control owners and (2) obtaining minutes of meetings and noting that the minutes had been approved. In addition, the Firm obtained a memorandum prepared by the CFO that described the methodology used in determining the ALL and the results of the application of that methodology. For each of the three controls, however, the Firm failed to ascertain and evaluate the nature of the review procedures that the control owners performed to assess the reasonableness of the ALL, including the criteria used by the control owners to identify matters for follow up and whether those matters were appropriately resolved. As a result, the Firm failed to determine whether the controls operated at a level of precision that would prevent or detect material misstatements. In addition, the Firm failed to identify and test any controls over the accuracy and completeness of certain reports used in the operation of the controls described above. (AS No. 5, paragraphs 39, 42, and 44)” (PCAOB; Grant Thornton 2016 report date, Issuer A) (2014 inspection year)

“In this audit, the Firm failed in the following respects to obtain sufficient appropriate audit evidence to support its audit opinion on the effectiveness of ICFR. The Firm failed to perform sufficient procedures to test the operating effectiveness of review controls over the existence, completeness, and valuation of revenue and accounts receivable. Specifically, the Firm's procedures were limited to discussing the controls with the control owners and observing the review, without evaluating whether the controls operated at a level of precision that would prevent or detect material misstatements, including evaluating the criteria used to identify items for investigation and/or determining whether specific items that were investigated were resolved. (AS No. 5, paragraphs 44 and 45)” (PCAOB; RSM 2014 report date, Issuer C) (2013 inspection year)

“[T]he Firm failed in the following respects to obtain sufficient appropriate audit evidence to support its audit opinion on the financial statements. [...] For two business units, the Firm failed to perform sufficient procedures to test revenue. Specifically, the Firm failed to sufficiently test the accuracy and completeness of system-generated data and reports used in testing revenue and unbilled accounts receivable. The Firm's procedures to test controls over accuracy and completeness were limited to obtaining an understanding of the system, and testing program change management through inquiry. (AS No. 15, paragraph 10)” (PCAOB; RSM 2014 report date, Issuer A) (2013 inspection year)

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