International Journal of Accounting Information Systems 28 (2018) 14–30

Contents lists available at ScienceDirect

International Journal of Accounting Information Systems

journal homepage: www.elsevier.com/locate/accinf

Nonprofessional investor perceptions of the partial remediation of IT and non-IT control weaknesses: An experimental investigation☆

Amanuel F. Tadesse[a], Uday S. Murthy[b,*]

[a] Department of Accounting, University of New Orleans, 2000 Lakeshore Dr. KH 478, New Orleans, LA 70148, United States
[b] Lynn Pippenger School of Accountancy, University of South Florida, 4202 E. Fowler Ave. BSN3403, Tampa, FL 33620, United States

ARTICLE INFO

Keywords:
Internal control material weakness
SOX 404
IT weaknesses
Adverse control reports
Partial remediation

ABSTRACT

In this study, we investigate whether nonprofessional investors' judgments about a firm with known and disclosed material weaknesses in internal control as required by the Sarbanes Oxley (SOX) Act of 2002 depend on the remediation strategy used by the firm. Analysis of SOX internal control weakness disclosures reveals that firms (1) often have multiple internal control weaknesses, (2) frequently have a mix of information technology (IT) and non-IT control weaknesses, and (3) invariably fail to remediate all control weaknesses in the period they are identified. We design an experiment to investigate how nonprofessional investors respond to remediation of a subset of disclosed material weaknesses in internal control, when a firm discloses a remediation plan that prioritizes the remediation of an IT (non-IT) internal control weakness leaving a non-IT (IT) weakness unremediated. We apply counterfactual theory to the future oriented remediation setting and find that investors favor a firm remediation strategy that prioritizes the remediation of an IT weakness over a strategy that prioritizes the remediation of a non-IT weakness. We further find that perceived effectiveness of remediation, financial misstatement risk attributed to the unresolved internal control weakness, and management credibility fully mediate the relation between company remediation strategies and investing judgments. These findings should be informative to both auditors and management when confronted with a range of IT and non-IT internal control weaknesses following the initial identification and disclosure of multiple material weaknesses as required by SOX.

1. Introduction

The Sarbanes-Oxley Act (SOX) of 2002 mandates that publicly traded companies report on the effectiveness of internal controls over financial reporting in the annual 10-K report to investors (SEC, 2003). When deficiencies in internal control have a material effect on the financial statements, as determined by management and the auditor, these control deficiencies are considered "material weaknesses" and must be disclosed in a specified section of the annual report (10-K), commonly referred to as the SOX 404[1] report.

Extant archival research in internal control weaknesses (ICWs) suggests that the market prices the disclosure of ICWs (Ashbaugh-

☆ We thank our anonymous reviewers, our discussant, and participants at the 2017 International Symposium on Accounting Information Systems (ISAIS). An earlier version of this paper was presented at the AIS Midyear Meeting, Raleigh, NC, January 24-25, 2014. We thank participants at the AIS midyear meeting for helpful comments. We also thank Peter Kipp, Pat Wheeler, and workshop participants at the University of South Florida for their comments. July 2017

* Corresponding author.
E-mail address: umurthy@usf.edu (U.S. Murthy).

[1] Section 404(a) requires all publicly traded companies (both smaller/non-accelerated filers and larger/accelerated filers) to provide the management report on the effectiveness of internal control over financial reporting. However, section 404(b) only requires larger and accelerated filers to include the auditor's opinion (one sentence) on the effectiveness of internal control on the annual report within management's report on internal controls over financial reporting (PCAOB, 2007).

https://doi.org/10.1016/j.accinf.2017.12.001
Received 15 February 2017; Received in revised form 8 November 2017; Accepted 11 December 2017
Available online 23 December 2017
1467-0895/ © 2017 Elsevier Inc. All rights reserved.

Skaife et al., 2009; Gupta and Nayar, 2007; Hammersley et al., 2008). Companies that fail to remediate disclosed material weaknesses in subsequent years suffer severe consequences such as increased audit fees, increased cost of capital and cost of debt, credit rating downgrades, restatements, and going concern opinions (Bedard et al., 2012; Gordon and Wilford, 2012; Hammersley et al., 2012; Hoag and Hollingsworth, 2011). Experimental research also shows that both professional and nonprofessional investors use the information in ICW disclosures (such as pervasiveness) in their judgments and decisions (cf. Asare and Wright, 2012; Arnold et al., 2011; Rose et al., 2010). Further, accounting literature indicates that the consequences of disclosure and remediation vary by the type of ICW and that the market also responds to these events depending on the type of ICW disclosed (Klamm et al., 2012).

It is important to make the distinction between information technology ICWs (hereafter IT weaknesses) and manual ICWs (hereafter non-IT weaknesses) because IT is integral to the production of financial statements, is pervasive throughout organizations, and supports most organizational operations (Canada et al., 2009). Research has documented various indirect and direct negative effects of IT weaknesses, such as poor financial performance, restatements, and a higher number of non-IT weaknesses and indirect stock price level performance (Boritz and Lim, 2008; Boritz et al., 2012; Klamm and Watson, 2009; Stoel and Muhanna, 2011). It is unclear, however, whether nonprofessional investors discriminate between IT and non-IT weakness disclosures. Moreover, given that IT and non-IT weaknesses have differential financial performance consequences (Stoel and Muhanna, 2011; Li et al., 2012), it is worth investigating whether nonprofessional investors value information related to remediation progress as it relates to these different types of ICWs, especially since regulators are concerned about nonprofessional investors' effective use of information in mandated public company disclosures (Christensen et al., 2014).

Due to resource constraints and differences in the severity and complexity of certain ICWs like IT weaknesses, companies often follow a *partial remediation* strategy where a subset of ICWs are remediated in a current period leaving others to be remediated in future periods (Bedard and Graham, 2011; Bedard et al., 2012; Klamm et al., 2012). Between 2006 and 2015, an examination of companies in the Audit Analytics database disclosing multiple ICWs reveals that an average of only 283 companies fully remediated their ICWs compared to an average of 1374 companies disclosing ICWs per year (21%).[2] Although an average of 260 of the 1374 companies disclosing multiple ICWs (19%) made some remediation progress by addressing one of their previously reported weaknesses, little is known about the consequences of partial remediation strategies when both IT and non-IT weaknesses simultaneously exist. Managers are confronted with these types of partial remediation decisions after auditors discover ICWs before the official year-end reporting (Bedard and Graham, 2011). Prior research indicates that nonprofessional investors' risk judgments and investment decisions are influenced by accounting information in financial statements (Lipe, 1998), and that they react to disclosures about material internal control weaknesses (Rose et al., 2010). When both IT and manual ICWs exist, it is important for managers to be informed about how nonprofessional investors might react to alternative partial remediation strategies where they choose to first remediate either IT or manual internal control weaknesses between third quarter and the year-end.

In this study, we address the following research questions related to IT and non-IT weaknesses in internal control: Do nonprofessional investors' judgments depend on whether the ICWs disclosed are exclusively IT or non-IT? How do nonprofessional investors respond to a partial remediation strategy prioritizing IT or non-IT weaknesses when both categories were initially disclosed? Answers to these questions should shed light on the pressing issue managers face when deciding to prioritize remediation of IT and non-IT ICWs after both ICWs are discovered. Nonprofessional investors are appropriate participants in this study because they represent around 24% of direct retail participation in the equity market along with 38% of indirect ownership through mutual funds, exchange traded funds, and pension plans (Goldman Sachs, 2013).

We conduct a two-stage experiment using nonprofessional investors as participants to address the aforementioned research questions.[3] In the first stage (the disclosure stage), we measure participants' perceptions of the likelihood of investing resulting from a disclosure that contained two ICWs. We manipulate whether the two ICWs disclosed were composed of exclusively IT weaknesses, exclusively non-IT weaknesses or a mix of IT and non-IT weaknesses, counterbalanced in two conditions. In the second stage (the remediation stage), we use the first stage dependent variable as a baseline measure to study the effect of partial remediation for scenarios where a non-IT and IT ICW are both present but only one is remediated. Participants are presented with management's plan to remediate one ICW out of the two ICWs disclosed in each condition, resulting in a remediation prioritization of IT over non-IT in one cell, a prioritization of non-IT over IT in another, and two other conditions in which the same type of ICW was remediated from a set of exclusively IT or non-IT ICWs disclosed (no prioritization).

Our predictions regarding nonprofessional investors' reactions to disclosures of IT and non-IT ICWs are based on prior human-computer interaction literature and counterfactual theory, which has been used by several researchers to examine organizational accountability and blame (cf. Naquin and Kurtzberg, 2004; Morris et al., 1999). Counterfactual theory indicates that individuals generate “could have” thoughts when assessing blame related to negative events by considering the alternatives the offender could have taken to avoid the negative event. Naquin and Kurtzberg (2004) use counterfactual theory to explain that individuals assign greater blame when the negative event occurred due to a human failure than when it occurred due to a technology failure because individuals are less able to imagine how a technology failure could have been avoided but can easily generate could have alternatives to avoid human failure. We extend this psychology literature and test whether predictions from the theory (underweighting blame for technology problems) hold in the remediation stage when organizations fail to remediate the negative event that was an IT weakness

[2] As shown in Table 1, the number of companies reporting ICWs in any single year includes first time ICW disclosing companies as well as repeat ICW disclosing (non-remediating) companies. Therefore, we only analyze the *average* yearly ICW disclosures and ICW remediation events.

[3] One complication in using an archival methodology is that IT weaknesses are commonly reported together with other non-IT weaknesses (Klamm and Watson, 2009; Klamm et al., 2012). Since the archival methodology precludes holding constant the type of control weaknesses while examining different remediation strategies, we employ an experiment using nonprofessional investors as participants to address our research questions.

(technology failure) but choose instead to remediate the manual weakness (human failure).

Results reveal that nonprofessional investors' perceptions of IT and non-IT weaknesses differ based on whether they are evaluating the ICW at the disclosure stage or the remediation stage. At the disclosure stage, we find no statistically significant evidence that nonprofessional investors were less likely to invest in the presence of non-IT weaknesses than IT weaknesses. This lack of significance in our finding is consistent with archival literature that has failed to find a significant difference in market reaction between IT and non-IT weakness disclosures. At the remediation stage, however, we find that nonprofessional investors reward a remediation prioritization strategy that remediated an IT weakness and deferred the non-IT weakness. Mean assessments of likelihood of investing in the company increased significantly for a partial remediation strategy that prioritized the IT weakness compared to one that prioritized the non-IT weakness. This result is consistent with research that indicates that conclusions from counterfactual theory do not readily translate for forward-looking events such as remediation. We further hypothesize and find that the positive effect of the plan to prioritize IT remediation is mediated by investors' perceptions of the effectiveness of the remediation plan leading to changes in management credibility, which in turn impacts investor's judgments.

This study contributes to literature and practice in auditing, accounting information systems (AIS), and crisis management. In auditing and AIS, our main contribution is to the literature on investor perceptions of remediation of ICWs when partial remediation involves the choice between IT and non-IT weaknesses. In crisis management, our contribution is related to management responses to attenuate negative implications of a crisis such as the discovery of ICWs. We apply counterfactual theory to explain the implications of different remediation strategies and show how the implications of the theory reverse when going from disclosure of ICWs (past events) to remediation of ICWs (forward looking events). We inform literature as well as practice through our finding that when IT weaknesses are disclosed along with non-IT weaknesses, managers are better served remediating an IT weakness before remediating a non-IT (i.e., manual) weakness.

The remainder of the paper is organized as follows. Section 2 provides the background, discusses prior literature and theory, and develops the hypotheses. Section 3 describes the experimental method. Section 4 provides the results of the statistical analyses. Section 5 summarizes the paper and discusses the implications of the findings.

2. Background and hypotheses development

2.1. Internal control weakness disclosures

Several archival studies have documented a negative abnormal stock price reaction and higher cost of equity associated with ICW disclosures (Ashbaugh-Skaife et al., 2009; Beneish et al., 2008; Hammersley et al., 2008; Hermanson and Ye, 2009). Experimental studies confirm these results and show that nonprofessional investors read SOX 404 reports and understand the associated investment risk of ICWs (Arnold et al., 2011; Asare and Wright, 2012; Rose et al., 2010; Shelton and Whittington, 2008). The research overall indicates that ICW disclosures are value relevant to investors (Ge and McVay, 2005).[4] Extant literature has not, however, investigated whether nonprofessional investors discriminate between IT and non-IT material control weaknesses.

2.2. IT and non-IT material weaknesses

Klamm and Watson (2009) find that companies with IT weaknesses are more likely to have severe internal control failures, more non-IT weaknesses, and subsequent restatements (Klamm and Watson, 2009; Boritz et al., 2012). Due to the pervasiveness of IT throughout the organization and the need to hire experienced IT experts, IT weaknesses are expected to be costly and lead to a much higher increase in audit fees than non-IT weaknesses (Canada et al., 2009). CEOs and CFOs of companies with IT weaknesses are more likely to lose their jobs and less likely to find employment after being terminated (Masli et al., 2009; Haislip et al., 2015). Controlling for audit fees, Boritz and Lim (2008) provide evidence that IT weaknesses are associated with poor financial performance. Stoel and Muhanna (2011) also find that firms with IT weaknesses have lower accounting earnings than firms with effective controls, controlling for the non-IT weaknesses reported within the same control report. They further suggest that IT weaknesses are priced by capital markets, albeit indirectly through accounting earnings. Li et al. (2012) find that firms with IT weaknesses have larger management forecast errors than similar firms with non-IT weaknesses or no material weaknesses. One would expect that the market and investors as a group would recognize these consequences of IT weaknesses but there is no study that has been able to document differences in market reaction between IT and non-IT weaknesses.

The human and computer interaction literature indicates that people hold companies less accountable when problems are caused by IT than when caused by humans. Furthermore, psychology literature suggests that people discount technology failures and consider it less severe than human failures. In an experimental setting, Naquin and Kurtzberg (2004) find that participants surveyed about a train accident assigned higher blame to the company when informed that the accident was caused by human operator error than when the failure was caused by a technology malfunction. Naquin and Kurtzberg (2004) use fairness theory to explain how counterfactual thoughts mediates the relationship between automation of the cause of the incident and the assignment of organizational blame. People generate more counterfactual ("could have") thoughts for human caused failures than for technology failures because people are easily able to generate more thoughts about what a human actor, whose actions are more flexible and imaginable, could have done to prevent the accident in the case of human failures, but cannot easily imagine what could have been done to

[4] See Schneider et al. (2009) for a comprehensive literature review on material weaknesses.

prevent failures caused by a technology actor (e.g., an accident caused by an automated train). Due to these differences in the amount of counterfactual thoughts generated, less generation of counterfactual thoughts resulted in lower attribution of blame to management for technology failures.

These types of thoughts of considering alternatives of how "things could have been better" are called *upward counterfactuals,* while thoughts relating to alternatives of how "things could have been worse" are called *downward counterfactuals* (Roese and Olson, 1995). *Upward* counterfactual thoughts (of how could things have been better) have been linked with negative affect and higher assignment of blame and *downward* counterfactual thoughts (of how things could have been worse) have been linked with positive affect and lower assignment of blame (Boninger et al., 1994). Prior work by Roese and Olson (1995) finds that counterfactual thoughts are moderated by outcome controllability and outcome valence. In situations where outcome controllability is low, such as accidents and external cybersecurity breaches, individuals generate more downward counterfactuals than situations where outcome controllability is higher, such as internal controls since management is responsible for maintaining effective internal controls according to (PCAOB, 2007; Wolfe et al., 2009). The market perceives cybersecurity breaches as bad news and reacts negatively due to the direct financial implications not present in ICW settings such as losing customers, issuance of credit monitoring costs, and the high-profile nature of breaches. This finding reconciles with counterfactual theory explanations because breaches are less controllable, leading to more downward (could have been worse counterfactual thoughts) where individuals are less able to generate counterfactual thoughts for IT failure. The lower the number of worse alternative thoughts, the higher the negative affect and assignment of blame for IT security breach incidents. However, our setting of disclosure of ICWs involves a different class of problems where outcome controllability is high due to management's responsibility for IC over financial reporting. Therefore, individuals are likely to consider alternatives considering how things could have been better i.e. upward counterfactuals in the setting of ICW reporting.[5]

Behavioral accounting research suggests that auditors consider IT material weaknesses that have a less direct financial link as less of an issue (under-classify the material weakness as a lower severity deficiency) when management confirms that the IT issue in controls exists (Wolfe et al., 2009). Counterfactual thinking based predictions are more suited to form hypotheses for nonprofessional investors than the contradicting archival literature based arguments, since they can particularly fail to recognize prior relationships and patterns in the market between IT weaknesses and the negative company consequences documented in archival research due to their processing limitations (Maines and McDaniel, 2000). We predict that nonprofessional investors will attribute less blame to management when they disclose an IT ICW because when they think of alternatives of how it could have been avoided, they will generate less alternatives of how and IT failure could have been avoided. Consistent with counterfactual theory, we hypothesize that nonprofessional investors will be less likely to invest in a firm when it initially discloses non-IT weaknesses than when it discloses IT weaknesses.

H1. Investors examining a potential investment in a firm will be less likely to invest in a firm when it exclusively discloses non-IT weaknesses than when it exclusively discloses IT weaknesses.

2.3. Remediation of material weaknesses

Researchers have investigated numerous questions associated with the remediation of material weaknesses[6] (see for example: Bedard et al., 2012; Boritz et al., 2012; Goh, 2009; Hammersley et al., 2012; Johnstone et al., 2011; Klamm et al., 2012). The general theme of the remediation literature is that there are benefits (costs) to companies that, in a timely manner, remediate (fail to remediate) material weaknesses in subsequent years.

The credit rating agency Moody's factors in the severity of certain material weaknesses, which may be harder to remediate, and the lack of remediation of ICWs as part of the criteria for downgrading the investment rating of companies (Jonas et al., 2007). Companies that fail to remediate ICWs incur higher audit fees and experience lower credit ratings as compared with those that remediated previously disclosed weaknesses (Hammersley et al., 2012). Additionally, companies are less likely to remediate material weaknesses when the weaknesses are more pervasive or when their operations are more complex (Hammersley et al., 2012).

2.4. Partial remediation of IT and non-IT material weaknesses

Not all ICWs are created equal; some are pervasive. A pervasive ICW is one that is more difficult to remedy, one with higher cost, one that has an entity-wide effect, or one that can influence the financial reporting system in several ways (Asare and Wright, 2012; Asare et al., 2013; Messier Jr. and Austen, 2000; PCAOB, 2007; Rose et al., 2010). Although IT is pervasive throughout organizations, an ICW in IT can also be isolated at the application or transaction level as manipulated in Rose et al. (2010). IT weaknesses are unique because, like pervasive ICWs, IT weaknesses are resource intensive, costlier to remediate, and persist longer than non-IT weaknesses (Bedard et al., 2012; Bedard and Graham, 2011; Canada et al., 2009; Klamm et al., 2012). Furthermore, companies are more likely to fail to remediate IT material weaknesses since those operations are expected to be more complex (Hammersley et al., 2012).

[5] We do not expect differences in the generation of upward and downward counterfactuals based on whether the disclosure condition is IT or non-IT because management control over whether an ICW is disclosed is not significantly different given that ICWs are the responsibility of management (internal source) and that they could have resolved either ICW before year-end.

[6] Remediation of material weaknesses is the resolution of one or more previously identified ICWs conveyed to investors by the disclosure of the remediation of the ICW or the act of non-reporting the same ICWs in a subsequent reporting period.

Table 1
Company disclosure and remediation of ICWs in audit analytics.

Fiscal year[b]	Firms with multiple ICWs[c]	Firms with multiple ICWs and an ITW	Firms that fully remediate ICWs	Firms that remediate a subset[a] of ICWs i.e. one prior ICW is remediated	Firms that remediate ITWs but not other ICWs (as % of subset[a] remediators)	Firms that remediate an ICW but not ITW (as % of subset[a] remediators)	Firms that partially[a] remediate ICWs, i.e. lower count of ICWs than prior report	Firms that remediate ITW but not other ICWs (as % of partial[a] remediators)	Firms that remediate an ICW but not ITW (as % of partial[a] remediators)
2006	985	254	43	23	4 (17.4%)	5 (21.7%)	10	3 (30.0%)	3 (30.0%)
2007	1379	380	415	222	28 (12.6%)	41 (18.5%)	90	24 (26.7%)	18 (20.0%)
2008	1439	320	453	337	36 (10.7%)	66 (19.6%)	172	27 (15.7%)	49 (28.5%)
2009	1388	233	373	338	28 (8.3%)	63 (18.7%)	220	22 (10.0%)	44 (20.0%)
2010	1466	232	287	311	35 (11.3%)	37 (11.9%)	201	29 (14.4%)	22 (10.9%)
2011	1473	225	265	233	30 (12.9%)	21 (9.0%)	163	21 (12.9%)	19 (11.7%)
2012	1444	201	253	231	21 (9.1%)	23 (9.9%)	173	16 (9.2%)	21 (12.1%)
2013	1506	231	224	280	17 (6.1%)	33 (11.8%)	215	14 (6.5%)	25 (11.6%)
2014	1517	265	244	313	30 (9.6%)	54 (17.3%)	185	22 (11.9%)	30 (16.2%)
2015	1138	184	271	313	36 (11.5%)	44 (14.1%)	142	22 (15.5%)	23 (16.2%)
Total	13,735	2525	2828	2601	265 (10.2%)	387 (14.9%)	1571	200 (12.7%)	254 (16.2%)
Average	1374	253	283	260			157		

[a] Subset represents the remediation of any weakness from a prior year, even if the count of weaknesses subsequently becomes higher. Partial remediation represents the reduction in the number of ICWs from a prior fiscal year report; this definition is consistent with prior literature in partial remediation and our experiment.

[b] The data set examined contained Audit analytics SOX 302 management ICW reporting data from period year ending Jan 1, 2006 to Dec 31, 2015. FY 2005 data was excluded because there was incomplete disclosure data and no remediation data for the base year FY 2005.)

[c] Audit analytics uses several categories to classify and code ICWs that have been reported by management. We use these categories to classify IT and non-IT weaknesses and count of ICWs.

Our setting of interest is a "partial remediation" scenario where a firm has a mix of IT and non-IT business process level ICWs[7] and management elects to remediate only a subset of those ICWs. Research relying on the Audit Analytics database indicates that organizations with SOX 404 reports that contain an IT weakness commonly report at least one non-IT weakness along with the IT weakness; however, prior research has not investigated how investors react to the remediation of one while holding the other unremediated (Bedard and Graham, 2011; Boritz et al., 2012; Klamm et al., 2012). Table 1 shows that partial remediation is common among public companies in the Audit Analytics database, and increasingly more common in the last three years when compared to full remediation. Given that both the remediation strategies of prioritizing IT and prioritizing non-IT ICWs are prevalent, it is important to determine if investors perceive such prioritizations differently.[8] In this study, we use a laboratory experiment to examine the most common and practical condition: the presence of both IT and non-IT weaknesses within the same internal control report and remediation of a subset of those ICWs leading to a decrease in the reported ICWs (i.e. partial remediation).

The predictions from counterfactual theory should differ between the ICW disclosure and ICW remediation plan settings, for three reasons. First, counterfactual thoughts differ based on whether the outcome valence is considered a failure or a success, such that failure is associated with upward (could have been better) counterfactuals and success is associated with downward (could have been worse) counterfactuals (Roese and Olson, 1995). We expect that management's remediation plan disclosing progress on remediating ICWs will be considered more of a success setting than the setting of initial disclosure of IC failure, resulting in the generation of less upward counterfactuals (alternatives of how it could have been better, or avoided in the first place) and more downward (alternatives of how it could be worse, or persist in the future). Second, although outcome controllability is likely higher in the remediation setting and should therefore trigger more upward counterfactuals in the absence of any remedial action, we expect that our setting of progress towards remediation in a partial remediation setting is likely to attenuate the upward counterfactual thought generation and likely to lead to more downward counterfactual thought generation, since management is taking responsibility (is less blameworthy) and is making progress towards resolution of the issue. Third, conclusions from the human-computer interaction literature relying on counterfactual theory directly transfer to settings that involve "could have been" considerations, i.e., the disclosure setting, whereas the remediation setting is likely to put investors in a mindset that makes future considerations of "could be" a priority. In this setting, we conjecture that individuals will consider questions such as how long it would take to remediate the ICWs, costliness of remediation, effectiveness of remediation, consequences of non-remediation and similar future oriented questions rather than only

[7] A commonly used distinction in practice is that between "general controls" and "application controls." Given the focus of investigation in this study on differential reactions to IT and non-IT controls, we deemed it important to keep the *function* of the internal control constant (i.e., what the internal control does) while manipulating only its *type* (i.e., whether the control is IT or non-IT). We determined that it was easier to describe equivalently functioning IT and non-IT internal controls at the application control (business process) level. For example, it is difficult to conceptualize a "non-IT" equivalent to program change controls (an example of a general IT control).

[8] We design an experiment to study this issue because it is difficult to disentangle the effects of partial remediation in an archival setting, since the types of IT and non-IT weaknesses disclosed and remediated across companies are different both in terms of control type and pervasiveness. Moreover, our research focuses on nonprofessional investors, whose perceptions cannot be studied using archival methods. Table 1 shows that both remediation strategies are common using two measures of remediation progress that is present in Audit Analytics: "subset" (an ICW in prior IC report is not present in a subsequent IC report) and partial (subsequent IC report contains less ICWs).

"could have" considerations. Counterfactual literature in psychology indicates that counterfactual theory predictions may not directly transfer to the context of future considerations and that the conclusions may actually be the reverse (Boninger et al., 1994). Moreover, future considerations could ameliorate the negative affect that individuals have when imagining past "could have" alternatives to mitigating mistakes (Boninger et al., 1994). Therefore, we find tension in investigating whether prior predictions consistent with humans discounting IT problems will continue to explain how investors would react to the remediation of IT and non-IT weaknesses.

We base our prediction on remediation by extending the arguments from counterfactual theory to the remediation setting of where individuals have thought of "what could be." In the evaluation of past alternatives, prior research has documented that humans tend to assign less blame to organizations that had a failure in IT, because they are unable to come up with alternatives of how the failure in IT could have been avoided resulting in the generation of fewer counterfactual thoughts in the setting of how could it have been avoided (Naquin and Kurtzberg, 2004; Wolfe et al., 2009). Projecting these findings into the remediation (forward-looking/success oriented) setting where individuals generate downward counterfactuals (how could it be any worse), individuals examining a lack of remediation (repeat in failure) of IT may not be able to come up with alternatives of how the failure in IT could be remediated in the future and could more easily imagine how an unremediated IT weakness can persist in the future and assume the worst. Thus, while individuals' inability to find alternatives to avoiding an IT problem would lead them to assign less blame for IT failure (IT weakness disclosure), their inability to find alternatives to resolve an IT problem while in the remediation forward looking mindset may lead them to expect that it will not be remediated in the near future (i.e., that the IT weakness will persist). Therefore, a remediation strategy that prioritizes the non-IT weakness, leaving the IT weakness unremediated should be viewed negatively from a forward-looking (downward counterfactuals) perspective.

Similarly, we expect that individuals will have a preference for IT remediation when considering the remediated ICW. Considerations of how could it be worse in the future lead individuals to think of how the remediation could fail in the future (downward counterfactual of how could it be worse). Alternatives of IT failure are less easily imagined than alternatives for non-IT failure (Naquin and Kurtzberg, 2004). Therefore, remediation of an IT weakness is expected to be less likely to fail than remediation of a non-IT weakness. When considering ICW remediation where prioritization of IT over non-IT or vice-versa occurs, individuals will view a remediation strategy that prioritizes the IT weakness (leaving the non-IT weakness unremediated) more favorably, since this strategy should be viewed more positively from a forward-looking (downward counterfactuals) viewpoint. Our formal hypothesis follows:

H2. Investors examining a potential investment in a firm will view a partial remediation strategy that prioritizes the remediation of an IT material weakness ***more favorably*** compared to a strategy that prioritizes the remediation of a non-IT material weakness.

In the remediation setting, management's selection of the remediation plan and its perceived effectiveness are important considerations for investors. Applying counterfactual theory and the computer-human interaction literature to this future oriented setting, individuals are expected to be less able to come up with alternatives of how IT fails due to its abstract nature. We expect investor perceptions of the effectiveness of management's remediation plans to be higher when IT is prioritized than when non-IT is prioritized because individuals are less able to imagine how IT failure can be addressed. Moreover, since remediation is more of a success setting than a failure setting, we expect individuals to be more optimistic and highlight the positive interpretation of management's remediation plan (Roese and Olson, 1995). Thus, a strategy that prioritizes remediation of IT over non-IT may earn management credit in terms of credibility for plans to resolve a seemingly more persistent and more difficult to remediate issue. Management's plan to remediate IT should be interpreted to be less likely to fail (less counterfactuals for IT), and thus more effective than a strategy that prioritizes remediation of non-IT over IT.

Investor perceptions of management credibility is an important mediator of investing decisions in the ICW disclosure and remediation settings (Rose et al., 2010, 2016). As noted earlier, based on counterfactual theory, a remediation plan that prioritizes remediation of an IT weakness should be viewed more positively from a forward-looking perspective in that it is perceived as being more effective. From a credibility theory perspective, the greater perceived effectiveness of a remediation plan that prioritizes the remediation of an IT weakness over a non-IT weakness should result in higher perceptions of management credibility. We formally hypothesize that revisions in investors' judgments in response to management remediation plans are mediated by perceptions of the effectiveness of the remediation strategy and management credibility.

H3. Investors' assessments of likelihood of investing in response to partial remediation prioritization strategies are mediated by their perceptions of the effectiveness of the remediation strategy and management credibility such that IT prioritization results in higher remediation effectiveness perception, leading to higher management credibility, and higher investing likelihood.

3. Method

3.1. Design

Our experiment employed a two-stage between-subjects randomized design. Given that our study is focused on the presence of multiple ICWs and the remediation of one of the disclosed weaknesses, all conditions contained an initial disclosure of two ICWs in stage one (MW-A and MW-B, each of which was either IT or non-IT) where initial assessments of investing likelihood is measured to test H1. One of these two disclosed ICWs (always MW-A) is subsequently said to be in the process of being remediated in stage two, where revision of prior assessments of investing likelihood is measured to test H2.

In the first stage, the disclosure pattern of ICWs is manipulated as whether the ICWs disclosed are of the same automation type (Uniform IT or non-IT), or are mixed in their automation type (Mix of IT and non-IT). Taking all combinations of IT and non-IT versions of the two disclosed business process ICWs (referred to as MW-A and MW-B) resulted in four conditions that became the baseline for our second stage where remediation plans were revealed. In the second stage, remediated ICW type is manipulated as IT or non-IT by remediating the first of the two ICWs disclosed (MW-A).

Depending on the combination of the IT or non-IT weaknesses in the ICW disclosure stage, when the first ICW of the two (MW-A) is remediated, it resulted in the investor seeing one of four possibilities: remediation of one IT weakness of the two IT weaknesses (no prioritization), remediation of one non-IT weakness of the two non-IT weaknesses (no prioritization), remediation of an IT weakness leaving a non-IT weakness unremediated (prioritization of IT over non-IT), and remediation of a non-IT weakness leaving an IT weakness unremediated (prioritization of non-IT over IT). The procedures and manipulations are described in detail in the "Tasks and procedures" section.

3.2. Participants

Participants were 265 Amazon Mechanical Turk (M-Turk) users. M-Turk users were selected consistent with several recently published studies in the accounting literature. M-Turk participants are more diverse than students, representative of non-professional investors, and as reliable as other offline methods of recruiting participants (Buhrmester et al., 2011; Paolacci et al., 2010; Rennekamp, 2012). Of the 265 participants 74 (28%) were female and 191 (72%) were male, with a mean age of 32. Most participants were college graduates (75%) and some were business graduates (38%). They had taken an average of 2.62 finance courses and 2.68 accounting courses.

Participants were recruited by publishing the M-Turk human intelligence task (HIT) announcement on Amazon. We used three screening questions that allowed access to our study if participants correctly indicated that they have invested in stocks within the past two years, have previously used financial statements to evaluate a company's performance, and correctly identified the financial statement that reports the profits and losses incurred during a specific period. These screening questions were combined with four distractor financial literacy questions and were required to be completed within 10 min, with no options to re-take the screening quiz.[9] Once qualified, participants were given access to the link for our online experimental survey.

Participants were recruited in two data collection exercises on the Amazon M-Turk platform. We initially offered $1.25 for our participants and learned that we were getting our data at a rate of about five participants per day.[10] After a few weeks, we decided to double the compensation to $2.50 and were able to collect the remaining data at a faster rate. The average time it took participants in the overall sample is 15.56 min. Participants who were compensated $1.25 finished the survey in 14.88 min and those who were compensated $2.50 finished the survey in 16.10 min. Given these averages, the hourly pay for the participants who completed our survey was $5.04 and $9.32 respectively.[11] Descriptive statistics on participants' demographics are presented in Table 2.

3.3. Independent variables

The independent variables used in the study are constructed to study the effects of disclosure of ICWs and partial remediation of ICWs. The experimental design comprises two stages. In the first stage, the disclosure stage, the independent variable is the pattern of ICWs manipulated as Uniform IT, Uniform non-IT, and Mix of IT and non-IT (counterbalanced). This design results in four cells in stage one, where the two disclosed ICWs are either (1) IT and IT, (2) non-IT and non-IT, (3) IT and non-IT, or (4) non-IT and IT. In the second stage, the remediation stage, the independent variable is the remediated ICW type, which is manipulated as IT or non-IT. Given the four cells from stage one, in stage two where the remediation plan is provided the resulting four cells are (1) IT remediated and IT not remediated, (2) non-IT remediated and non-IT not remediated, (3) IT remediated and non-IT not remediated, and (4) non-IT remediated and IT not remediated. In stage two, given the focus on prioritization of remediation, the cells of interest are #3 (IT prioritized) and #4 (non-IT prioritized).

3.4. Dependent variables

Participants are asked to assess the *likelihood or chance* that they would invest in the stock of the company (*No chance* = 0, *Certain to Invest* = 100) after the initial disclosure of the ICWs and a second time after participants read about the remediation of ICWs (Asare and Wright, 2012). The first dependent variable is *initial likelihood of investing* at disclosure and is used to test hypothesis H1. The second dependent variable is the extent of *investment revision*, which is calculated by taking the difference between the initial *likelihood of investing* measure and the revised *likelihood of investing* assessments made with the knowledge of partial remediation of internal controls. The *investment revision* variable is used to test hypotheses H2 and H3.

[9] We do not have data on participants who failed the screening quiz because it is performed as a "qualification quiz" on the M-Turk platform. Those who fail the qualifying criteria are banned by M-Turk from completing our HIT and were never allowed access to our research link.

[10] The slow rate of data collection resulted due to our screening questions eliminating potential participants and our prevention of participants who had completed the pilot version of this study. The pilot was aimed at determining whether the manipulations are salient and to ensure that the instrument worked in its entirety.

[11] Task time was not statistically significantly different between the $1.25 and $2.50 compensation groups. In subsequent tests on our dependent variable, we use the combined sample and statistically control for the incentive level.

Table 2
Demographic and sample statistics.

Variables[a,c]	Final Sample (usable)	n = 186	Excluded sample[b] (speeders)	n = 79	F	*p*-Value
	Mean	Std Dev	Mean	Std Dev		
Gender						
Male	**72.04%**	**n = 134**	72.15%	n = 57	0.001	0.986
Female	**27.96%**	**n = 52**	27.85%	n = 22		
College graduates	**73.66%**	**n = 137**	75.95%	n = 60	0.152	0.697
Age	**34.35**	**(10.43)**	30.61	(8.46)	7.943	**0.005**
Revenues vs. expenditures	**3.51**	**(1.05)**	3.77	(1.26)	3.180	**0.076**
Annual report (10k) familiarity	**4.08**	**(1.83)**	4.76	(1.57)	8.295	**0.004**
IC report familiarity	**3.48**	**(1.70)**	4.53	(1.40)	23.198	**0.000**
IC reliance relative to financials	**17.82%**	**(15.71)**	29.58%	(18.20)	28.216	**0.000**
ICW understanding check	**2.98**	**(1.63)**	3.19	(1.72)	0.858	0.355
Understanding of IT controls	**3.95**	**(1.46)**	4.29	(1.34)	3.250	**0.073**
Investment experience (years)	**10.04**	**(9.25)**	7.50	(6.79)	4.344	**0.038**
Manipulation check failure rate	**24.19%**		45.57%		12.407	**0.001**
Incentives ($1.25 or $2.50)	**2.01**	**(0.61)**	1.79	(0.62)	7.651	**0.006**
Paid $1.25	**38.71%**		56.96%			
Paid $2.50	**61.29%**		43.04%			
Duration on survey (mins)	**17.42**	**(8.50)**	11.18	(5.43)	36.339	**0.000**
Time on training page (mins)	**2.91**	**(2.53)**	0.63	(0.23)	64.012	**0.000**
Time on MW disclosure page (mins)	**5.14**	**(3.29)**	3.45	(3.70)	13.482	**0.000**
Time on MW remediation page (mins)	**2.70**	**(1.90)**	2.02	(1.56)	8.056	**0.005**
Initial likelihood of investing	**46.51**	**(25.29)**	52.33	(24.31)	3.009	**0.084**
Revised likelihood of investing	**48.84**	**(25.84)**	55.77	(23.94)	4.168	**0.042**

[a] The results in subsequent models remain significant and qualitatively similar as related to the inferences regarding our independent variables when we include and remove these variables as covariates in subsequent ANOVA tests.

[b] Speeders took under 1 min to read and complete the introductory training page where participants were familiarized with SOX and internal controls, IT and non-IT business process controls, and asked to assess their familiarity with financial statements, ratios, 10k reports, analyst reports, and IC reports.

[c] Understanding of IT controls - self assessed (1-low level, 7-high level), ICW understanding check - "What is the effect of ICW on financial reporting?" (1-negative effect, 7-positive effect), Annual report (10 k) familiarity, IC report familiarity (1-least familiar, 7-most familiar), Manipulation Check failure is defined as 1 if participants failed one of the two manipulation check questions, Initial likelihood of investing – Investing assessments at the disclosure of MWs (1 - No chance, 100 - Certain to invest), Revised likelihood of investing – revisions of investing assessments after MW partial remediation plan is revealed (1 - No chance, 100 - Certain to invest).

3.5. Task and procedures

The experiment began with a training page containing a brief description of some types of financial performance information, the Sarbanes Oxley Act, a definition of a material weaknesses in internal controls (since it is required to be included in SOX 404 reports), and several examples of deficiencies in business process internal controls that are either automated or manual. On the same page, we measured participants' familiarity with the following disclosures: summary financial statements, financial analyst recommendations, key financial ratios, annual 10-K reports, and internal control reports.[12] The purpose of this training page was to familiarize participants with different types of ICWs and the requirements of the Sarbanes Oxley Act. Although the information on this training page likely resulted in heightening awareness of the requirements of the Sarbanes Oxley Act beyond what the average nonprofessional investor might know, it does not threaten internal validity since the information was provided to participants in all conditions and our focus is on *differential perceptions* of ICW disclosure and remediation strategies between conditions. Participants were then provided the task description and company background information and continued to the first stage of our experiment (see Fig. 1).

During the first stage of the experiment, participants read financial statement snapshots,[13] financial performance and market performance ratios, as well as the spread of analysts' recommendations (1–strong buy, to 5–sell). Below the financial information, on the same page, a Management Report on Internal Controls over Financial Reporting (AS No. 5) is included which contained two different types of material weaknesses.[14] As shown in the Appendix, these material weaknesses were manipulated at two levels (IT and non-IT). Therefore, a participant saw one of four possible combinations of IT/non-IT versions of two ICWs disclosed on the internal control report (MW-A, MW-B): two IT weaknesses, two non-IT weaknesses, an IT weakness listed below a non-IT weakness, and a non-IT weakness listed below an IT weakness. Participants made assessments of their initial likelihood of investing in light of this information, which forms the dependent variable for H1 to compare the exclusively IT and exclusively non-IT disclosure

[12] We include a timer to measure whether participants were speeding through the experiment and had not read the important information on the training page. We expected participants to spend at least 1 min on this page.

[13] The financial statement information was taken from an actual publicly traded company and modeled after the snapshots on Google finance and Yahoo finance.

[14] The report on internal control over financial reporting represents only around 30% of the space on the page where the materials were presented. Since our focus was on the impact of differences in weakness type (IT or non-IT) and remediation pattern (IT or non-IT) across conditions, the length of the report and all other information was held constant across all conditions.

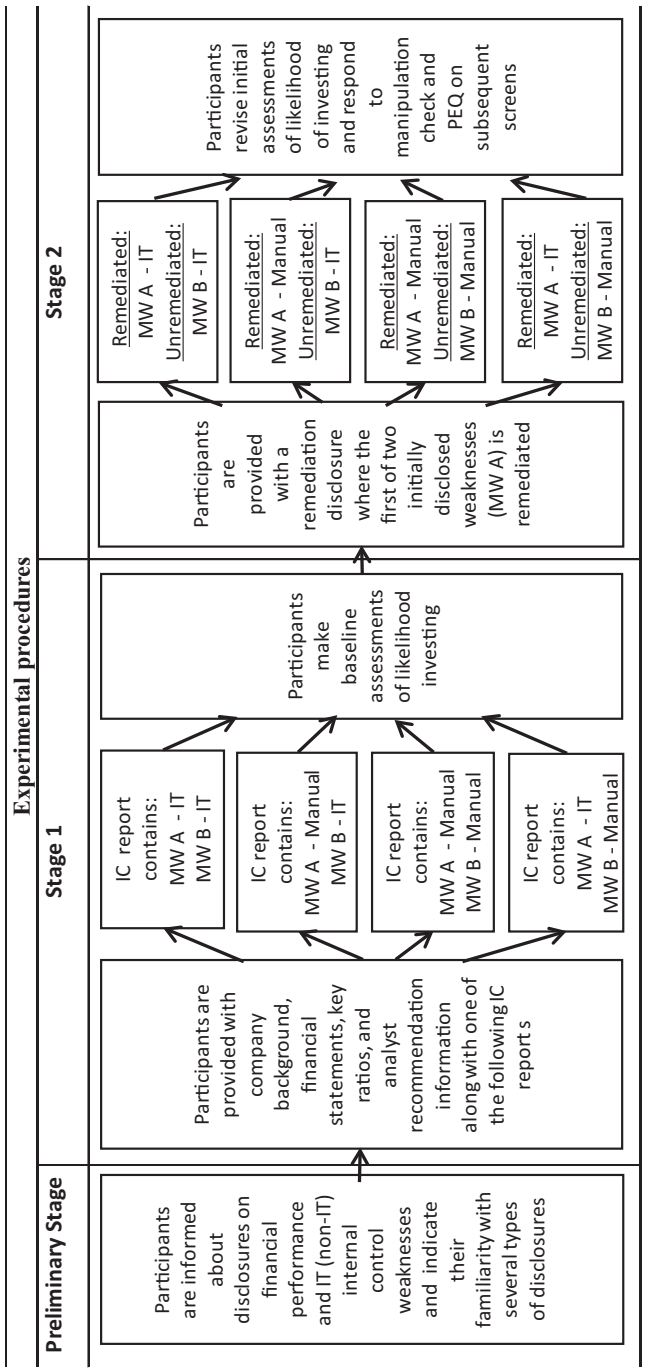


Fig. 1. Experimental procedures.

conditions. For the mix of IT/non-IT conditions used to test H2, this assessment forms the baseline that is used to construct our *investment revision* dependent variable.

During the second stage of the experiment, participants were presented with a partial remediation plan where they were told which one of the two identified ICWs is being remediated by management.[15] The first control weakness, "MW-A," (regardless of whether it was initially disclosed as IT or non-IT) was being remediated across all treatment conditions while the other control weakness remained unremediated. Thus, our two conditions of interest for H2, which include the combination of whether remediation ICW type is IT or non-IT across the conditions where the pattern of ICW disclosure is a mix of IT and non-IT, are referred to in the paper as *Prioritize IT remediation* (remediate IT/postpone non-IT) and *Prioritize non-IT remediation* (remediate non-IT/postpone IT). Participants were then reminded of their initial likelihood of investing assessment value from stage 1 and were asked to revise their likelihood of investing in light of the remediation information. Thereafter, participants responded to manipulation check questions, demographic questions, and a post-experimental questionnaire.

4. Results

4.1. Attention check

Due to the concern that participants obtained from an online pool such as Amazon Mechanical Turk are motivated primarily by the compensation offered and thus may not pay close attention to the particulars of the task, we examined whether participants had spent enough time on the initial training page discussing internal controls, SOX, and several types of manual and automated ICWs. We found that 79 participants had spent less than 1 min reading our ICW training page and responding to all our questions on that page; therefore, we examined the data from these inattentive speeding participants separately to determine how they differ from the remaining sample.

As shown in Table 2, participants who spent less than 1 min reading our training page (hereafter, "speeders") were significantly younger ($p < 0.01$), had less investment experience ($p < 0.05$), and had an overall experiment time that was 6 min less than the non-speeding sample (11.18 vs. 17.25). The non-speeding sample was made up of a larger proportion of the group that was paid $2.50 and the speeding pool was made up of a larger proportion of the group that was paid $1.25. The mean likelihood of investing assessment after disclosure of ICWs was significantly lower from the mid-point of 50 ($t = -1.885$, $p = 0.03$) only for non-speeders and the groups were significantly different in their likelihood of investing assessments ($p < 0.10$). The higher mean of investing for the speeders was inconsistent with their higher mean assessments of reliance on internal control report (29.58%) relative to the non-speeding group (17.89%, $p < 0.01$). Moreover, 45.57% of the speeders had failed the manipulation check questions whereas only 24.19% of the non-speeders had failed the manipulation check questions. Consequently, to test the hypotheses we used a final sample of 186 usable responses that we considered to be of good quality.[16]

4.2. Manipulation check

As a manipulation check, participants were asked the following questions for material weaknesses A & B respectively: "Recall the internal control weakness that was remediated (material weakness "A", in AP). Was this internal control performed primarily manually by company personnel or was it an internal control performed automatically by the computer system?" and "Recall the internal control weakness that was NOT remediated (material weakness "B", in sales). Was this internal control performed primarily manually by company personnel or was it an internal control performed automatically by the computer system?" with the options for each question worded as "*Internal control performed manually primarily by company personnel*" and "*Internal control performed automatically by the computer system*". One hundred fifty eight out of 186 participants (84.9%) responded to this question correctly for the remediated ICW (MW-A) and 162 out of 186 participants (87%) answered the question correctly for the unremediated ICW (MW-B).[17] Removing the 44 participants (24%) who had failed to correctly answer either of the two questions does not qualitatively alter the results of hypothesis testing.

Similar to Rose et al. (2010), we also confirmed that participants attended to our task by having them respond to an understanding check question "How does the presence of internal control weaknesses affect a company's financial reporting system" (1- negative effect, 4- no effect, 7- positive effect). The mean responses to this question was 2.968, which is significantly different from the mid-point of 4 ($t = -8.678$, $p < 0.001$), confirming that our more attentive participants understood the task. Those who failed the manipulation check questions had mean responses of 3.68, which is not significantly different from the mid-point of 4 ($t = -1.347$, $p = 0.185$) but is significantly different from the mean responses of 2.74 for those who passed manipulation checks ($p < 0.01$).

[15] In our setting, we initially disclose internal control weaknesses and then present management's *plan* for remediation, rather than *actual remediation* of the disclosed weaknesses. Goodfellow and Willis (2007) indicate that regulators and practitioners believe that disclosures of remediation plans is important. Gupta and Nayar (2007) document that the negative market reaction to disclosures of ICWs is mitigated when disclosing a remediation plan. While studying the consequences of non-remediation, Hammersley et al. (2012) report that 90.9% of their sample firms indicated a remediation plan.

[16] Our test of H2 and H3 are weaker but remain significant when we include the speeders in our sample ($p < 0.10$).

[17] The higher failure of manipulation check resulted from the lower attention from using an online participant pool who are not supervised in a laboratory setting, a limitation of using M-Turk participants (Goodman et al., 2013).

Table 3
Descriptive statistics and correlations.

Panel A: Descriptive statistics by experimental condition - mean (s.d.)

Pattern of ICW disclosures	Uniform (exclusively IT)	Mixed (combination of non-IT and IT)	Uniform (exclusively non-IT)	Mixed (combination of IT and non-IT)	Overall
Disclose	All IT	non-IT & IT	All non-IT	IT & non-IT	
Remediate	IT	non-IT	non-IT	IT	Sample
	n = 54	n = 43	n = 42	n = 47	n = 186
Initial likelihood of investing	49.28	46.28	43.19	46.49	46.51
	(22.62)	(26.39)	(25.58)	(27.28)	(25.29)
Revised likelihood of investing	50.22	45.70	46.76	51.98	48.84
	(24.80)	(27.36)	(25.24)	(26.45)	(25.84)
Investment revision	0.94	− 0.58	3.57	5.49	2.33
	(14.59)	(15.52)	(11.28)	(13.42)	(13.93)
Remediation effectiveness	5.02	5.14	4.83	5.60	4.17
	(1.14)	(1.23)	(1.17)	(1.04)	(1.29)
Misstatement risk - unremediated MW	7.22	7.74	7.17	7.00	7.27
	(2.75)	(3.00)	(2.72)	(3.19)	(2.91)
Management credibility	4.06	3.85	3.99	4.32	4.06
	(1.09)	(1.52)	(1.25)	(1.17)	(1.26)
Severity MW delta	0.07	0.09	− 0.02	− 0.23	− 0.02
	(2.57)	(3.33)	(3.41)	(3.43)	(3.15)

Panel B: Correlations (n = 186)

	1	2	3	4	5	6
1. Initial likelihood of investing						
2. Revised likelihood of investing	**0.865**					
	0.000					
3. Investment revision	**− 0.212**	**0.261**				
	0.004	0.000				
4. Remediation effectiveness	**0.283**	**0.382**	**0.182**			
	0.000	0.000	0.000			
5. Misstatement risk - unremediated MW	**− 0.371**	**− 0.529**	**− 0.290**	**− 0.273**		
	0.000	0.000	0.000	0.000		
6. Management credibility	**0.375**	**0.599**	**0.426**	**0.477**	**− 0.524**	
	0.000	0.000	0.000	0.000	0.000	
7. Severity MW delta	**− 0.159**	− 0.018	**0.280**	0.057	**− 0.218**	**0.112**
	0.030	0.812	0.000	0.443	0.000	0.127

Initial likelihood of investing (1 - No chance, 100 - Certain to invest).
Revised likelihood of investing (1 - No chance, 100 - Certain to invest).
Investment revision: Revised - Initial likelihood of investing (1 - No chance, 100 - Certain to invest).
Misstatement risk - unremediated MW: Assessment of the effect on the financial statements of the unremediated MW (1-Little to no risk of misstatement, 7-Very significant risk of misstatement).
Management credibility: Mean of management trust and competence (7 point Likert Scale) adapted from Rennekamp (2012).
Severity MW delta: The difference in severity assessments of MW_A (in payroll) and MW_B (in sales) on a Likert scale (1 = Very low severity, 7 = Very high severity).

4.3. Descriptive statistics

Descriptive statistics on our investing dependent variables and other outcome variables are provided by experimental condition in Table 3. Mean initial likelihood of investing after disclosure of ICWs is lower in the Uniform non-IT ICW condition and highest in the Uniform IT ICW condition. Prioritization of IT remediation (IT remediation when a mix of IT and non-IT ICWs were disclosed) has the highest favorable investment revision and prioritization of non-IT remediation (non-IT remediation when a mix of IT and non-IT ICWs were disclosed) has a negative investment revision. Investment revision in the uniform IT/IT and mix of non-IT/IT is not significantly different from zero ($p > 0.10$), suggesting that investors do not reward partial remediation if an IT weakness remains unremediated. The mean assessments of risk of misstatement due to the unremediated ICW is lowest in the prioritization of IT remediation condition and highest in the prioritization of non-IT remediation conditions. Severity ratings for both ICWs shown to a given participant were not significantly different across conditions. The mean for management credibility is lowest in the prioritization of non-IT remediation condition and highest in the prioritization of IT remediation condition. We also include correlation analyses in Table 3.

Table 4
Investing judgments after ICW disclosure.

Panel A: Likelihood of Investing Judgments when ICWs are disclosed: Mean (s.d.) {n}[a].

Pattern of disclosed ICWs	Uniform IT/IT	Mix of non-IT/IT	Uniform non-IT/non-IT	Mix of IT/non-IT
DV: initial likelihood of investing at ICW disclosure	**49.28** **(22.62)** **{54}**	46.28 (26.39) {43}	**43.19** **(25.58)** **{42}**	46.49 (27.28) {47}

Panel B: Planned contrast tests of H1

	t statistic	df	*p*-Value [c]
Overall effect[b]	1.165	182	0.122
Uniform IT > uniform non-IT Test of H1 not Supported	1.235	94	0.109
Mixed conditions[d]	0.037	88	0.970

[a] Initial likelihood of investing: Investing assessments at stage one in response to ICW disclosure (1 = No chance, 100 = Certain to invest).
[b] Contrast weights were assigned as follows: + 1 for the Uniform (exclusively) IT condition, − 1 for the Uniform (exclusively) non-IT condition, 0 s for the mixed IT/non-IT conditions (1, 0, − 1, 0).
[c] p-Values for comparisons that were hypothesized represent 1-tailed tests for H1.
[d] p-Values for comparisons that were not hypothesized represent 2-tailed tests.

4.4. Test of Hypothesis 1

Hypothesis H1 is related to the assessments of likelihood of investing when multiple of the same automation category of ICWs are disclosed. H1 predicts that investors are less likely to invest when the pattern of ICWs disclosed is exclusively non-IT (Uniform non-IT) than when the disclosed ICWs are exclusively IT weaknesses (Uniform IT). Panel B on Table 4 contains our test of H1 through a simple mean comparison of means of investment in the Uniform IT and Uniform non-IT conditions. The results from our directional *t*-tests indicate lack of support for hypothesis that the likelihood of investing at the disclosure stage is higher in the exclusively IT weakness disclosure condition than in the exclusively non-IT condition ($t = 1.235$, $p = 0.1099$, 1-tailed). Although the direction of the means is consistent with the counterfactual literature predictions and the findings in Wolfe et al. (2009), the lack of market reaction to IT weaknesses in prior ICW archival studies suggests that the effect size might be very small and we did not have sufficient power in our experiment to detect it ($\eta^2 = 0.016$, power = 0.231). Another possible explanation for the lack of statistical significance is that participants' investment judgments may have incorporated information other than ICWs when assessing the initial likelihood of investment, resulting in high variance in this measure. We find no support for H1.

4.5. Test of Hypothesis 2

Hypothesis H2 is concerned with examining the effect of remediation strategies in cases of IT weaknesses being reported along with non-IT weaknesses and remediation of a subset of the disclosed ICWs, which is most common in practice (Bedard and Graham, 2011; Klamm et al., 2012). The planned contrast test, presented on Table 5 Panel B, testing whether the predicted pattern of IT remediation prioritization (when a mix of IT/non-IT ICWs had been disclosed) leads to more favorable investment revisions than non-IT remediation prioritization (when a mix of non-IT/IT ICWs had been disclosed) is significant ($t = 2.078$, $p = 0.02$, 1-tailed). Simple effect tests reveal that a remediation strategy that prioritizes IT remediation was viewed more favorably than a strategy that prioritizes non-IT remediation ($t = 1.990$, $p = 0.025$, 1-tailed).[18] Remediation of one ICW where the unremediated ICW is also of the same type, i.e. partial remediation in the uniform conditions with no prioritization is not significantly different across the conditions ($t = 0.964$, $p = 0.338$). Therefore, H2 is supported.

4.6. Test of Hypothesis 3

Hypothesis H3 predicts double mediation such that IT remediation prioritization affects perceptions of the effectiveness of the remediation, which affects perceptions of management credibility, resulting in changes in investing judgments. The counterfactual theory explanation that has been used in prior IT versus manual literature is that individuals forgive companies with IT failure because they cannot imagine alternatives of how an IT failure could have been avoided. As expected, and consistent with theory, participants' assessments of effectiveness of the remediation plan (1-ineffective, 7-effective) were higher ($p = 0.03$, 1-tailed) and

[18] Our results are qualitatively similar when we control for management credibility, self-assessed IT control knowledge, familiarity with 10-Ks, risk measures (Weber et al., 2002), preference for revenues over expenditures, perceived effectiveness of remediation, and other demographic variables. There were no significant interactions between these variables and our independent variable.

Table 5
Investment revisions after partial ICW remediation.

Panel A: Revisions in Likelihood of Investing Judgments after ICW remediation: Mean (s.d.) {n}

Pattern of disclosed ICWs	Uniform IT/IT	Mix of non-IT/IT	Uniform non-IT/non-IT	Mix of IT/non-IT
Remediated ICW type	IT	**non-IT**	non-IT	**IT**
DV: Investment revision	0.94	− 0.58	3.57	5.49
	(14.59)	(15.52)	(11.28)	(13.42)
	{54}	{43}	{42}	{47}

	t statistic	*df*	p-Value[b]
Overall effect[a]	2.078	182	**0.020**
Prioritization (mixed) conditions - IT remediation > on-IT remediation prioritization Test of H2 is supported	1.990	88	**0.025**
Remediation across Uniform IT vs. non-IT (no prioritization)[c]	0.964	94	0.338

Variable definition
Investment Revision: Revised - Initial likelihood of investing (1 - No chance, 100 - Certain to invest).
[a] Contrast weights were assigned as follows: + 1 for the Remediate IT/Mix of IT and non-IT, − 1 for the Remediate non-IT/Mix of IT and non-IT, 0 for Uniform IT, and 0 for Uniform non-IT conditions (0, − 1, 0, 1).
[b] p-Values for hypothesized comparisons represent 1-tailed tests for H2.
[c] p-Values represent 2-tailed tests.

management credibility[19] were higher in the condition where the firm prioritized the remediation of the IT weakness over the non-IT weakness than the condition where the firm chose to remediate the non-IT weakness first (p = 0.05, 1-tailed).

We tested H3 using structural equation modeling (SEM) path analysis to explore the mechanism through which perceptions of effectiveness of remediation may work to affect credibility and investing judgments.[20] The model depicted on Table 6 indicates that remediation effectiveness perceptions directly affect credibility which affects perceptions of the risk of misstatement that is related to the ICW that is not remediated and investment revisions. We had not formally hypothesized risk of misstatement from the remaining ICW as a mediator since it was formalized in prior literature that it could mediate investing judgments in the ICW setting (cf. Asare and Wright, 2012). Inclusion of misstatement risk in the path model helps understand how the risk of misstatement and remediation choices are related, and our results remain significant when removing it. The model fit statistics of the path model indicated a good model fit (p = 0.822, χ^2 = 1.5, df = 4, GFI = 0.993, NFI Delta1 = 0.978, RFI rho1 = 0.945, and RMSEA = 0.000). The results confirmed the double mediation pattern where IT remediation prioritization affected perceived remediation effectiveness which led to higher assessments of management credibility and finally resulting in greater investment revisions.

The future counterfactual thinking argument would suggest that when management reveals a plan to remediate a non-IT weakness from a mix of IT and non-IT ICWs, nonprofessional investors will generate more thoughts of how the remediation can fail and assess a lower likelihood that the remediation plan will be effective in remediating the chosen weakness when non-IT remediation occurs. To evaluate this argument, we examined if perceived remediation effectiveness of the remediation plan for MW A is any different for IT and non-IT weaknesses and find that effectiveness is perceived to be higher when an IT weakness is being remediated than when a non-IT weakness is being remediated across the mixed disclosure conditions (F = 3.656, p = 0.030, 1-tailed).[21] Although we do not have a direct measure of whether investors are considering future alternatives and generating more counterfactuals, our result is consistent with the idea of IT being perceived as less likely to fail.

Counterfactual thinking explanations would also predict that individuals would generate alternatives to the remediation of unremediated ICWs. If unremediated IT weaknesses were deemed to be less likely to be remediated in the future since a deficiency in IT is more abstract and is less imaginable than a non-IT one, individuals would have less optimistic investment revisions when IT ICWs are left unremediated. Investment revisions were significantly less positive in the collapsed conditions where IT remained unremediated than the conditions where non-IT weaknesses remained unremediated (F = 4.54, p = 0.017, 1-tailed); however, we do not find a significant difference in perceptions of risk of misstatement based on the unremediated control type across the collapsed conditions (F = 0.770, p = 0.160, 1-tailed, power = 0.14).[22] Perceptions of effectiveness of remediation affects investors'

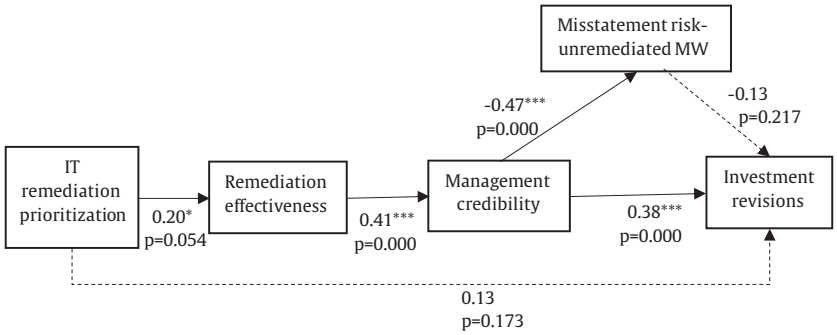
[19] Management credibility is constructed using the average of management trust and competence (Rennekamp, 2012). Management trust was measured using 7 point Likert scale questions: "what is your assessment of management's trust?" (1-Very untrustworthy, 7-Very trustworthy). Management competence was measured using 7 point Likert scale questions: "what is your assessment of management's competence?" (1-Very incompetent, 7-Very competent).

[20] We also tested our mediation hypothesis by using the approach recommended by Baron and Kenny (1986) and find a significant double mediation through remediation effectiveness and management credibility.

[21] We also find that remediation effectiveness (captured by perceptions of the whether the remediation plan will succeed in remediating the proposed ICW for remediation) is significantly lower for non-IT remediation conditions than IT remediation conditions (p = 0.041, 1-tailed).

[22] Risk of misstatement across conditions where unremediated ICW is of the same type as the remediated type (no prioritization) is not significantly different (7.22 vs. 7.17, F = 0.01, p = 0.461, 1-tailed). However, the results of risk of misstatement across conditions where partial remediation progress is of a different type (prioritization occurs) is consistent with results on investment perceptions in that means risk of misstatement was higher when IT was not being remediated, albeit insignificant (7.74 vs 7.00, F = 1.293, p = 0.129, 1-tailed).

Table 6
Path model[a].



Variable definitions
Investment Revisions: Revised - Initial likelihood of investing (1 - No chance, 100 - Certain to invest).
Remediation Effectiveness: Responses to the question "Do you think the remediation plan will be effective in fixing the material internal control weakness selected for remediation?" (1- Ineffective, 7-Effective).
Management Credibility: Mean of management trust and competence assessments (7 point Likert Scale) adapted from Rennekamp (2012).
Misstatement Risk-Unremediated MW: Assessment of the effect on the financial statements of the unremediated MW (1-Little to no risk of misstatement, 7-Very significant risk of misstatement).
IT remediation prioritization: a dichotomous variable as 1 if the condition was an IT remediation leaving a non-IT weakness unremediated, and 0 if the condition was a non-IT remediation leaving IT weakness unremediated.
* $p < 0.10$
** $p < 0.05$
*** $p < 0.01$
[a] p-Values in the path model represent 2-tailed tests.

perceptions of management credibility, which then leads to revisions in investing judgments. The results of the path model provide support for the double mediation path predicted in H3.

5. Discussion and conclusion

We investigate perceptions of nonprofessional investors when multiple ICWs are disclosed and when firms prioritize the remediation of IT or non-IT weaknesses as a subset of the multiple weaknesses disclosed (i.e., when firms engage in partial remediation). We find that nonprofessional investors respond differently to IT and non-IT weaknesses depending on whether they are being disclosed or remediated. In the disclosure stage, nonprofessional investors do not appear to perceive the exclusive disclosure of multiple non-IT weaknesses any different from the exclusive disclosure of multiple IT weaknesses. This lack of significance, while borderline and in the predicted direction, may be due to the competing forces of the counterfactual thinking versus empirics of negative company outcomes of IT weaknesses that some investors might be familiar with. We believe that the effect size may be small at the disclosure stage, which is consistent with archival research in accounting that has not documented market reaction differences between IT and non-IT ICWs.

In the remediation phase, nonprofessional investors adjust their investing judgments based on the firm's choices regarding the type of ICW (IT or non-IT) to prioritize for remediation. We hypothesize and find that nonprofessional investors' revisions of their likelihood of investing are significantly lower when management chooses to remediate a non-IT weakness and postpone the remediation of an IT weakness when compared to the case of management remediating an IT weakness leaving a non-IT weakness unremediated. We hypothesize and find that investing judgments in response to partial remediation are mediated by their perceptions of the effectiveness of the remediation plan and management credibility. Nonprofessional investors apparently view a partial remediation plan with a strategy that prioritizes remediation of a manual (non-IT) weakness over an IT weakness less positively, because the remediation strategy is viewed as less likely to be effective. Investors' perceptions of the effectiveness of management's remedial efforts affects their perceptions of management credibility. Subsequent analyses support the view that management is viewed as being less credible when choosing such a remediation strategy that prioritizes remediation of a non-IT weakness over an IT weakness, as compared to when the remediation strategy prioritizes remediation of an IT weakness over a non-IT weakness.

This study contributes to the counterfactual theory literature by documenting that in the ICW reporting setting, prior findings of IT being discounted and associated with lower blame do not hold in situations where individuals are considering future alternatives. We inform the literature in auditing and accounting information systems that relates to investor perceptions of material weakness disclosures and IT internal control weaknesses by documenting differential reactions by nonprofessional investors to partial remediation strategies that prioritize non-IT weaknesses over IT weaknesses. We also contribute to management literature on how management's choices regarding remediation of detected internal control weaknesses are perceived by investors and stakeholders of the firm. Specifically, a management strategy of remediating identified control weaknesses that prioritizes IT weaknesses over non-IT weaknesses is perceived most positively by nonprofessional investors.

The results of this study have implications for managers and internal audit practitioners who currently make recommendations regarding remediation of IT and non-IT weaknesses. While their recommendations have hitherto lacked empirical evidence of how alternative strategies may affect the investor population, our study informs practice directly by investigating the case that is most

common in practice: disclosure of non-IT weaknesses along with IT weaknesses in the same internal control report and the choice to remediate one before the other. The findings indicate that it will be wise to remediate a technology weakness first despite the potentially higher resources and effort associated with the remediation of such ICWs.

The results of this study should be interpreted in light of its limitations. Our study is generalizable to only the subset of investors who access the internal control disclosure information to make their investing decisions.[23] The term "IT weakness" refers to a broad category of internal controls that vary in the degree of automation and there are differences in how specific IT weaknesses impact organizations' internal controls. Some IT control weaknesses are more likely to lead to misstatements and are significantly harder to remediate, while others are considered less severe (Boritz et al., 2012; Klamm et al., 2012). A limitation of this study is that we used transaction level business process internal controls to investigate our research questions, and thus, our results are limited to these types of ICWs. Although we modeled the disclosure of weaknesses after actual company reports, to maintain internal validity we used similar phrases for the two ICWs within the report. Actual internal control disclosures are richer, longer, and potentially not as easily accessible by nonprofessional investors (Arnold et al., 2011).

There is a possible order effect resulting from the two control weaknesses being disclosed in the same order and the remediation of only the first of the two disclosed weaknesses. We believe that randomization and the use of between-subjects measures alleviates this concern as the order was the same across experimental conditions. Finally, to alleviate the concern that the effect may be cycle specific, we selected two different types of transaction level operational weaknesses, one in the revenue cycle and another in the expenditure cycle. Since participants may perceive revenues to be more important than expenditures, we measured their perceptions of importance of revenues versus expenses in the post-experimental questionnaire. This measured cycle preference variable was not significantly different across conditions and including it in our model does not significantly change our results.

Future research can examine whether these differences hold in cases where the linkages of the ICWs to a financial misstatement is less apparent. Although we held this variable constant in our study, some technology controls (such as access controls) are expected to be less likely to cause a misstatement than technology controls in a specific accounting cycle. While a potential misstatement is a criterion for disclosure of material weaknesses, it is unknown whether nonprofessional investors will view an indirect effect such as access to systems in the same light as those with a direct effect on the financial statements. Another avenue for future research is to explore whether our results generalize to the professional investor and analyst communities. Finally, in light of the recent increase in cybersecurity incidents worldwide, future research could investigate whether investor reactions to such incidents differ between breaches caused by IT failures versus human failures.

Appendix

A.1. Experimental manipulations

A.1.1. Material weakness A

IT version: Certain controls designed to ensure accuracy of vendor payments within the computerized accounting system in the expenditure cycle did not operate effectively. Specifically, in the system's accounts payable module, the automated process of matching invoices with purchase orders resulted in invalid payments to some vendors.

Non-IT version: Certain controls designed to ensure accuracy of vendor payments within the manual accounting process in the expenditure cycle did not operate effectively. Specifically, in the accounts payable (AP) function, the process of AP personnel manually matching vendor invoices with purchase orders resulted in invalid payments to some vendors.

A.1.2. Material weakness B

IT version: Certain controls designed to ensure the appropriateness of customer sales discounts within the computerized accounting system in the revenue cycle did not operate effectively. Specifically, in the system's sales module, the automated process of applying sales discounts resulted in incorrect sales discount amounts for some sales orders.

Non-IT version: Certain controls designed to ensure the appropriateness of customer sales discounts within the manual accounting process in the revenue cycle did not operate effectively. Specifically, in the sales function, the process of sales personnel manually applying sales discounts resulted in incorrect sales discount amounts for some sales orders.

A.2. Examples of remediation plans

A.2.1. Attitude drinks incorporated, 10-K for the period ended March 31, 2014A.2.1.1. Remediation efforts to address deficiencies in internal control over financial reporting. As a result of the findings from the evaluation conducted of the effectiveness of our internal control over financing reporting as set forth above, management intends to take practical, cost-effective steps in implementing internal controls, including the following remedial measures:

* Interviewing and potentially hiring outside consultants that are experts in designing internal controls over financial reporting

[23] Arnold et al. (2011) document a limitation that 25% of professional investors and 41% of nonprofessional investors in their study did not view the SOX 404 disclosure when presented with actual 10-K reports. However, with the renewed focus of internal controls by the SEC and the PCAOB, it is likely that these numbers have changed.

based on criteria established in Internal Control-Integrated Framework issued by COSO.

* The Company has hired an outside consultant to assist with controls over the review and application of derivatives to ensure accounting in conformity with generally accepted accounting principles.
* Board to review and make recommendations to shareholders concerning the composition of the Board of Directors, with particular focus on issues of independence. The Board of Directors to consider nominating an audit committee and audit committee financial expert, which may or may not consist of independent members as funds allow.

Due to inadequate financing, the Company has not hired any outside experts to design additional internal controls over financial reporting or recommended a new board director that is a financial expert.

A.2.2. New Media Insight Group, 10-Q for the period ended January 31, 2016

Our size has prevented us from being able to employ sufficient resources to enable us to have an adequate level of supervision and segregation of duties within our internal control system. Therefore, while there are some compensating controls in place, it is difficult to ensure effective segregation of accounting and financial reporting duties. Management reported a material weakness resulting from the combination of the following significant deficiencies:

- Lack of segregation of duties in certain accounting and financial reporting processes, including the approval and execution of disbursements;
- The Company's corporate governance responsibilities are performed by the Board of Directors; we do not have any independent directors, we do not have an audit committee or compensation committee. Because our Board of Directors only meets periodically throughout the year, several of our corporate governance functions are not performed concurrent (or timely) with the underlying transaction, evaluation, or recordation of the transaction.

While we strive to segregate duties as much as practicable, there is an insufficient volume of transactions at this point in time to justify additional full time staff. We may not be able to fully remediate the material weakness until we increase operations at which time we would expect to hire more staff.A.2.2.1. Plan for remediation of material weaknesses. To mitigate the current limited resources and limited employees, we rely heavily on direct management oversight of transactions, along with the use of legal and accounting professionals. As we grow, we expect to increase our number of employees and engage outsourced accounting professionals, which will enable us to implement adequate segregation of duties within the internal control framework. We will continue to monitor and assess the costs and benefits of additional staffing.

References

Arnold, V., Bedard, J.C., Phillips, J.R., Sutton, S.G., 2011. Do section 404 disclosures affect investors' perceptions of information systems reliability and stock price predictions? Int. J. Account. Inf. Syst. 12 (4), 243–258.

Asare, S., Wright, A., 2012. The effect of type of internal control report on users' confidence in the accompanying financial statement audit report. Contemp. Account. Res. 29 (1), 152–175.

Asare, S., Fitzgerald, B., Graham, L., Joe, J., Negangard, E., Wolfe, C., 2013. Auditors' internal control over financial reporting decisions: analysis, synthesis, and research directions. Audit. J. Pract. Theory 32 (1), 131–166.

Ashbaugh-Skaife, H., Collins, D., Kinney, W., LaFond, R., 2009. The effect of SOX internal control deficiencies on firm risk and cost of equity. J. Account. Res. 47 (1), 1–43.

Baron, R.M., Kenny, D.A., 1986. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J. Pers. Soc. Psychol. 51 (6), 1173.

Bedard, J.C., Graham, L., 2011. Detection and severity classifications of Sarbanes-Oxley section 404 internal control deficiencies. Account. Rev. 86 (3), 825–855.

Bedard, J.C., Hoitash, R., Hoitash, U., Westermann, K., 2012. Material weakness remediation and earnings quality: a detailed examination by type of control deficiency. Audit. J. Pract. Theory 31 (1), 57–78.

Beneish, M.D., Billings, M., Hodder, L., 2008. Internal control weaknesses and information uncertainty. Account. Rev. 83 (3), 665–703.

Boninger, D.S., Gleicher, F., Strathman, A., 1994. Counterfactual thinking: from what might have been to what may be. J. Pers. Soc. Psychol. 67 (2), 297–307.

Boritz, E., Lim, J., 2008. IT Control Weaknesses, IT Governance and Firm Performance (Working paper). University of Waterloo.

Boritz, E., Hayes, L., Lim, J., 2012. What Do auditor's Reports on Internal Control Tell Us About IT Control Weaknesses in Financial Reporting Systems? (Working paper). University of Waterloo.

Buhrmester, M., Kwang, T., Gosling, S.D., 2011. Amazon's Mechanical Turk: a new source of inexpensive, yet high-quality, data? Perspect. Psychol. Sci. 6 (1), 3–5.

Canada, J., Sutton, S., Kuhn Jr., R., 2009. The pervasive nature of IT controls: an examination of material weaknesses in IT controls and audit fees. Int. J. Account. Inf. Manag. 17 (1), 106–119.

Christensen, B.E., Glover, S.M., Wolfe, C.J., 2014. Do critical audit matter paragraphs in the audit report change nonprofessional investors' decision to invest? Audit. J. Pract. Theory 33 (4), 71–93.

Ge, W., McVay, S., 2005. The disclosure of material weaknesses after the Sarbanes-Oxley act. Account. Horiz. 19 (3), 137–158.

Goh, B.W., 2009. Audit committees, boards of directors, and remediation of material weaknesses in internal control. Contemp. Account. Res. 26 (2), 549–579.

Goodman, J.K., Cryder, C.E., Cheema, A., 2013. Data collection in a flat world: the strengths and weaknesses of Mechanical Turk samples. J. Behav. Decis. Mak. 26, 213–224.

Goodfellow, J., Willis, A., 2007. CEO challenge. CA Mag. 140 (1), 32–37.

Gordon, L., Wilford, A., 2012. An analysis of multiple consecutive years of material weaknesses in internal control. Account. Rev. 87 (6), 2027–2060.

Gupta, P., Nayar, N., 2007. Information content of control deficiency disclosures under the Sarbanes-Oxley Act: an empirical investigation. Int. J. of Gov. Discl. 4, 3–23.

Haislip, J.Z., Masli, A., Richardson, V.J., Watson, M.W., 2015. External reputational penalties for CEOs and CFOs following information technology material weaknesses. Int. J. Account. Inf. Syst. 17, 1–15.

Hammersley, J., Myers, L., Shakespeare, C., 2008. Market reactions to the disclosure of internal control weaknesses and to the characteristics of those weaknesses under Section 302 of the Sarbanes Oxley Act of 2002. Rev. Acc. Stud. 13 (1), 141–165.

Hammersley, J., Myers, L., Zhou, J., 2012. The failure to remediate previously-disclosed material weaknesses in internal controls. Audit. J. Pract. Theory 31 (2), 73–111.

Hermanson, D.R., Ye, Z., 2009. Why do some accelerated filers with SOX Section 404 material weaknesses provide early warning under Section 302? Audit. J. Pract. Theory 28 (2), 247–271.
Hoag, M., Hollingsworth, C., 2011. An intertemporal analysis of audit fees and section 404 material weaknesses. Audit. J. Pract. Theory 30 (2), 173–200.
Johnstone, K., Li, C., Rupley, K.H., 2011. Changes in corporate governance associated with the revelation of internal control material weaknesses and their subsequent remediation. Contemp. Account. Res. 28 (1), 331–383.
Jonas, G., Rosenberg, A., Gale, M., Hedges, L., 2007. The Third Year of Section 404 Reporting on Internal Control. Moody's Investors Service (Available at:). http://ssrn.com/abstract=985546.
Klamm, B.K., Watson, M., 2009. SOX 404 reported internal control weaknesses: a test of COSO framework components and information technology. J. Inf. Syst. 23 (2), 1–23.
Klamm, B.K., Kobelsky, K.W., Weidenmier Watson, M., 2012. Determinants of the persistence of internal control weaknesses. Account. Horiz. 26 (2), 307–333.
Li, C., Peters, G., Richardson, V., Weidenmier Watson, M., 2012. The consequences of information technology control weaknesses on management information systems: the case of Sarbanes-Oxley internal control reports. MIS Q. 36 (1), 179–203.
Lipe, M.G., 1998. Individual investors' risk judgments and investment decisions: the impact of accounting and market data. Acc. Organ. Soc. 23 (7), 625–640.
Maines, L.A., McDaniel, L.S., 2000. The effects of comprehensive income characteristics on nonprofessional investors' judgments: the role of financial statement presentation format. Account. Rev. 75 (2), 179–207.
Masli, A., Richardson, V.J., Watson, M.W., Zmud, R.W., 2009. CEO/CFO Engagements in Information Technology Management: The Disciplinary Effects of Sarbanes–Oxley Information Technology Material Weaknesses (Working Paper). University of Arkansas, Mississippi State University, and University of Oklahoma.
Messier Jr., W.F., Austen, L.A., 2000. Inherent and control risk assessments: evidence on the effects of pervasive and specific risk factors. Audit. J. Pract. Theory 19 (2), 119–131.
Morris, M.W., Moore, P.C., Sim, D.L., 1999. Choosing remedies after accidents: counterfactual thoughts and the focus on fixing “human error”. Psychon. Bull. Rev. 6 (4), 579–585.
Naquin, C., Kurtzberg, T., 2004. Human reactions to technological failure: how accidents rooted in technology vs. human error influence judgments of organizational accountability. Organ. Behav. Hum. Decis. Process. 94, 121–141.
Paolacci, G., Chandler, J., Ipeirotis, P., 2010. Running experiments on Amazon Mechanical Turk. In: Judgment in Managerial Decision Making, Fifth edition. 5 (5).
Public Company Accounting Oversight Board (PCAOB), 2007. Auditing Standard No. 5: An Audit of Internal Control Over Financial Reporting That is Integrated With an Audit of Financial Statements. PCAOB, Washington, DC.
Rennekamp, K., 2012. Processing fluency and Investors' reactions to disclosure readability. J. Account. Res. 50 (5), 1319–1354.
Roese, N.J., Olson, J.M., 1995. Outcome controllability and counterfactual thinking. Personal. Soc. Psychol. Bull. 21 (6), 620–628.
Rose, J., Norman, C., Rose, A., 2010. Perceptions of investment risk associated with material control weakness pervasiveness and disclosure detail. Account. Rev. 85 (5), 1787–1807.
Rose, A.M., Rose, J.M., Norman, C.S., 2016. Material control weakness corrections: the enduring effects of trust in management. Behav. Res. Account. 28 (2), 41–53.
Sachs, Goldman, 2013. Goldman Sachs Portfolio Strategy Research: An Equity Investor's Guide to the Flow of Funds Accounts (Available from:). http://www.btinvest.com.sg/system/assets/12141/Goldman%20Sachs%20-%20US%20Strategy%202013%20Mar%2011%20GS.pdf.
Schneider, A., Gramling, A., Hermanson, D., Ye, Z., 2009. A review of academic literature on internal control reporting under SOX. J. Account. Lit. 28, 1–46.
Securities and Exchange Commission (SEC), 2003. Final Rule: Management's Reports on Internal Control Over Financial Reporting and Certification of Disclosure in Exchange Act Periodic Reports. SEC, Washington, DC.
Shelton, S.W., Whittington, O.R., 2008. The influence of the auditor's report on investors' evaluations after the Sarbanes-Oxley Act. Manag. Audit. J. 23 (2), 142–160.
Stoel, M.D., Muhanna, W., 2011. IT internal control weaknesses and firm performance: an organizational liability lens. Int. J. Account. Inf. Syst. 12, 280–304.
Weber, E.U., Blais, A., Betz, N., 2002. A domain-specific risk-attitude scale: measuring risk perceptions and risk behaviors. J. Behav. Decis. Mak. 15, 263–290.
Wolfe, C.J., Mauldin, E.G., Diaz, M.C., 2009. Concede or deny: do management persuasion tactics affect auditor evaluation of internal control deviations? Account. Rev. 84 (6), 2013–2037.