LITERATURE REVIEW:

CURRENT KNOWLEDGE ON INTERNAL CONTROL

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1. Introduction

The importance of internal control over financial reporting (ICOFR) has increased over the past few decades. All over the world, governments are reinforcing regulations related to internal controls, forcing firms as well as their auditors to direct more attention to the quality of internal controls in place. Along with the growing importance of ICOFR, researchers have conducted studies examining different aspects relating to internal controls. To provide a broad overview of the current understanding of internal control systems, in this literature review we provide a summary and synthesis of studies conducted. First, we describe how regulations around internal controls are reinforced in different jurisdictions. Second, we discuss the drivers and consequences of internal control weaknesses and evaluate the consequences of remediating reported internal control weaknesses. Third, we assess the influence of different organizational bodies on ICOFR quality, more specifically that of executives, the audit committee and the board of directors. In addition, we discuss how external auditors use and evaluate their clients' internal control systems. Finally, we present suggestions for future research. We conclude that although many studies have examined a number of aspects relating to internal controls, research examining how internal control systems jointly interact with other stakeholders is currently lacking. Furthermore, it remains unclear how auditors evaluate internal controls and how they adjust their audit approach based on these evaluations. This underscores the importance of future research in this field, as audit quality might be negatively affected by (biased) evaluations and auditor conclusions on internal control effectiveness based on internally established audit guidelines that are currently unsupported by academic research.

2. Internal control systems

Internal control systems are of key importance for firms' internal decision-making processes and external financial reporting quality. The Committee of Sponsoring Organizations of the

Treadway Commission (COSO) framework defines internal control as "a process, effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives relating to operations, reporting and compliance" (COSO, 2013). Phrased differently, internal controls are mechanisms put in place to provide reasonable assurance that the firm is well-managed, transparent, and complies with all applicable laws and regulations. Internal controls essentially affect all parts of the organization, but the responsibility for internal controls lies primarily with the top of the organization, namely management and the board of directors (Li, Sun, & Ettredge, 2010).

Despite conventional wisdom on the merits of having high-quality internal controls in place (e.g., the first COSO report was issued in 1992), internal controls initially attracted scarce research and public interest. Only over the past two decades, regulators and academics have started to devote more attention to the topic, triggered by accounting scandals such as those relating to Enron, Worldcom, Steinhoff, and Royal Ahold. The United States have been front runners in this respect, enacting the Sarbanes-Oxley Act (SOX) in 2002 as one of the first and most influential laws in strengthening the internal controls of organizations. The bulk of internal control research has consequently focused on the U.S. market, as the implementation of SOX fundamentally reshaped the control environment of U.S. corporations. Two sections in the Act are particularly important. First, Section 302, effective from August 2003, requires management, and specifically the CEO and CFO, to sign off on the financial statements, confirming their fairness and the effectiveness of the firm's internal controls (Geiger & Taylor, 2003). The focus is on material weaknesses in internal control, i.e., Section 302 does not require disclosure of minor deficiencies in internal controls (Kim & Park, 2009).[1] Second, Section 404 of SOX formalized these disclosures and came into force for accelerated filers almost two years

[1] We refer to Geiger and Taylor (2003) for a more detailed discussion of the SOX 302 provisions and their origin.

later. Section 404 requires management to formally report on the strength and effectiveness of internal controls, after which the auditor is required to make an independent evaluation of these controls in a separate report. This evaluation concerns the adequacy of the internal control system for safeguarding financial reporting quality and any shortcomings that are identified as a material weakness.[2] ICOFR is necessary for providing "reasonable assurance about the reliability of a company's financial reporting and its process for preparing and fairly presenting financial statements in accordance with GAAP" (PCAOB, 2004). The reasoning of the Public Company Accounting Oversight Board (PCAOB) is that defective internal controls allow for undetected material misstatements in the interim or annual financial statements (PCAOB, 2004). Prior research supports this reasoning, showing that the discovery and reporting of internal control deficiencies prior to SOX-mandated audits are associated with more prior SEC enforcement actions and financial restatements (Ashbaugh-Skaife, Collins, & Kinney Jr, 2007). Following SOX, firm risk-taking has consequently decreased considerably (Bargeron, Lehn & Zutter, 2010).

Other jurisdictions have followed suit, albeit in a less stringent and more indirect way. For example, around the early 2000s, France, Germany, and Italy all significantly strengthened the power and independence of the board of directors with the explicit goal of increasing management oversight and improving internal control (Enriques & Volpin, 2007). Harmonization at the European level followed with the European Audit Directive 2006/43, strengthening the role of the auditor and the audit committee. In Asia, China is one of the front runners. The Chinese economy was subject to a wide range of reforms over the past decades. At the start of the millennium, the initial focus was on internal control over financial reporting processes, but following SOX, the Chinese legislator has expanded the rules to cover internal

[2] For a detailed discussion of the SOX 404 provisions, please refer to Kinney Jr., Martin, and Shepardson (2013).

control over operating processes as well (Li, Shu, Tang & Zheng, 2017). In Australia and New Zealand, stock exchanges increasingly emphasized the importance of internal control over financial reporting in 2003, following a change in corporate legislation in 2002 (Australian Stock Exchange Corporate Governance Council, 2003; CLERP 9, 2002; New Zealand Exchange Limited, 2003). The regulation of internal control in these countries all centered on strengthening some of the key monitoring mechanisms in the company, which should then improve internal control quality. This approach contrasts sharply with the strategy of the U.S. legislator, who enforces a formal evaluation of internal controls by both managers and auditors, explicitly focusing on the quality of internal controls. Given that the overwhelming amount of empirical research on internal control quality takes place in the U.S., benchmarking the two approaches is difficult. However, it is clear from these initiatives that the importance of internal control over firm operations and reporting quality has substantially increased throughout the world.

3. Drivers and consequences of weaknesses in internal control systems

3.1. Drivers of weaknesses in internal control

Despite its importance, what constitutes a high-quality internal control system is still unclear. Regulators worldwide have targeted various aspects such as board oversight or audit committee expertise, but in the end, the design of internal controls largely varies across organizations. Rather than defining when internal controls are effective, prior research has generally focused on when internal controls are *defective*, i.e., when the controls cannot guarantee that the financial statements are free from error or management influence. The general phrasing is that one or more “material weaknesses” exist in the internal control systems. Two types of material weaknesses are generally distinguished: Account-specific and company-wide material weaknesses (Doyle, Ge & McVay, 2007). While account-specific weaknesses can be audited

and individually checked, company-level weaknesses are more difficult to audit and call into question not only management's ability to prepare accurate financial reports, but also its ability to control the business (Doss & Jonas, 2004).[3] The underlying reasons also differ, with account-specific weaknesses originating from specific characteristics and company-wide problems originating from a lack of resources or experience to maintain comprehensive control systems (Doyle et al., 2007).

Given the importance of sound internal control systems, a relevant question is whether and when these material weaknesses arise. Prior research provides ample evidence on the drivers of material weaknesses in internal controls. A first set of determinants is derived from the firm's operations. For example, prior research has shown a positive association between material weaknesses and firm complexity, financial distress, diversification, and operational control risk (Doyle et al., 2007; Lawrence, Minutti-Meza & Vyas, 2017; Rice & Weber, 2012). Conversely, a negative association exists with firm size, age and profitability, as well as external capital needs (Doyle et al., 2007; Ge & McVay, 2005; Rice & Weber, 2012). These studies suggest that detection and disclosure incentives play a role in whether existing material weaknesses are reported. A second set of determinants originates from the firm's governance environment. Ge and McVay (2005), for example, find that poor internal control is usually related to an insufficient commitment of resources for accounting controls. In later sections in this review, we discuss the effects of management, audit committee, and board characteristics on ICOFR quality. Next to that, we review associations between auditors and ICOFR quality. In essence, we underscore the importance of considering the governance environment in which the firm

[3] As an example of account-specific weaknesses, Ge and McVay (2005) identify deficient revenue-recognition policies, deficiencies in the period-end reporting process and accounting policies, inappropriate account reconciliation, and errors in current accrual accounts such as accounts receivable and inventory accounts as the most likely weaknesses. Material weakness disclosures by management also frequently describe internal control problems in complex accounts, such as derivative and income tax accounts (Ge & McVay, 2005).

operates and its effects on ICOFR quality. In aggregate, we conclude that the underlying firm characteristics are key factors affecting the quality of internal controls.

3.2. Consequences of weaknesses in internal control

Following the COSO framework, material weaknesses in internal controls should be associated with inferior firm performance and low accounting quality. The effects of defective internal controls have consequently been the topic of extant empirical research.

A first line of research focuses on accounting quality (see Table 1), finding a general consensus that defective internal controls are negatively associated with the quality of financial reporting. On the basis of a unique dataset, Prawitt, Smith and Wood (2009) show that a higher quality of the internal audit function is associated with reduced earnings management, as proxied by abnormal accruals and the propensity to meet or just beat analysts' earnings forecasts. Given that direct data on internal control quality is generally unavailable for researchers, most studies focus on the association between material weaknesses in internal control and accounting quality. A study by Ashbaugh-Skaife, Collins, Kinney Jr, and Lafond (2008) finds that firms with material weaknesses in internal controls have higher accrual noise and larger abnormal accruals, relative to firms without these weaknesses. Moreover, the authors show that changes in accrual quality are correlated with changes in internal control quality. Their findings are corroborated by Chan, Farrell, and Lee (2008), who find some evidence that there are more positive and absolute discretionary accruals for firms reporting material internal control weaknesses relative to firms without these material weaknesses. Furthermore, Kim, Richardson, and Watson (2018) show that information-technology related material weaknesses are associated with subsequent restatements, less accurate forecasts, and lower earnings quality. Taken together, these studies confirm the importance of having high-quality internal controls for accounting quality.

A second, emerging stream of research attempts to isolate the "real" effects of defective internal controls, going beyond accounting quality to consider operational issues (see Table 2). A first study by Cheng, Dhaliwal and Zhang (2013) shows that following the disclosure of a material weakness in their internal control systems, firms' investment efficiency significantly improves. The authors interpret the evidence as indicative of the firm addressing the deficiency, thereby improving firm processes and investment. A second study by Lawrence et al. (2017) focuses on operational control risk and documents important interrelations between operational control risk and material weaknesses in the overall internal control system. A third study by Feng, Li, McVay and Skaife (2014) examines the association between inventory-related weaknesses in internal control and firms' inventory management. This study shows that firms with inventory-related material weaknesses have systematically lower inventory turnover ratios and are more likely to report inventory impairments. Inventory turnover improves when the weaknesses is remediated. Moreover, the authors provide evidence that firms' returns on assets are associated with the existence of material weaknesses in general, supporting the claim that internal control quality has a real impact on firm processes. In a fourth study, Sun (2016) shows that firms with weak internal controls have significantly lower investments and that, upon remediation, excessive risk-taking decreases. Taken together, these studies give insight into the potential positive effects from having stronger internal controls.

3.2.1. Market reactions to weaknesses in internal control

The studies mentioned earlier show the importance of internal control systems in affecting firm outcomes. Surprisingly, despite the large body of evidence showing the importance of having high-quality internal controls, the market seems to have difficulties understanding these relations (see Table 3). Market responses to the formal disclosure of material weaknesses following SOX 404 are ambiguous and difficult to draw conclusions from. One set of studies

documents a positive association between the disclosure of a material weakness and the cost of equity as well as credit and loan spreads (Asbhaugh-Skaife, Collins, Kinney Jr. & LaFond, 2009; Dhaliwal, Hogan, Trezevant & Wilkins, 2011; Kim, Song & Zhang, 2011). Questioning these findings, Beneish, Bilings and Hodder (2008) find no noticeable impact of Section 404 disclosures on stock prices or a firm's cost of capital, while Ogneva, Subramanyam and Raghunandan (2007) find an initial association, which disappears after controlling for various firm characteristics. While the findings regarding SOX 404 are mixed, the market does seem to respond strongly to the disclosure of material weaknesses following SOX 302, which preceded the formal reporting requirement contained in SOX 404 (Beneish et al., 2008; Hammersley, Meyers & Shakespeare, 2008; Hermanson & Ye, 2009). Reconciling the conflicting evidence on the disclosure of material weaknesses and reactions by the equity market, Gordon and Wilford (2012) focus on persistent weaknesses in internal controls and their subsequent remediation. The authors show that reporting material weaknesses in consecutive years significantly increases the firm's cost of equity. However, the market views a reduction in the number of material weaknesses favorably as a partial remediation. This partial remediation and the type of material weaknesses are likely key determinants of the differential market responses to material weaknesses.

The mixed market reactions to internal control provisions match the broader findings of prior research examining SOX as a whole. That is, the provisions in SOX had their initial opponents, who regarded the Act as the making of "quack" corporate governance and an example of poor policy making in the aftermath of a crisis (Romano, 2004). The mixed support and critical evaluation of the law persists, with especially the SOX 404 provisions on internal control quality being regarded as too costly, with a too strict implementation (Coates & John, 2007; Romano, 2009). Three studies provide empirical support for the potential costs associated with installing strong internal controls. First, Zhang (2007) examines the cross-sectional

variation of U.S. firms' returns around the implementation of important SOX provisions. Her results show that the implementation of non-audit services and governance provisions imposed net costs on firms. More importantly, she provides evidence that deferring the compliance with Section 404, which, as stated earlier, mandates an internal control test, resulted in significant cost savings for non-accelerated filers. This finding provides direct evidence on the potential costs associated with the formal evaluation and disclosure of internal control weaknesses. Second, Bova, Minutti-Meza, Richardson and Vias (2014) and Engel, Hayes and Wang (2007) show that the potentially high costs associated with the SOX provisions push firms towards going private. Specifically, Engel et al. (2007) show that the implementation of SOX is associated with an increase in the frequency of going-private transactions. Bova et al. (2014) confirm this finding by documenting that SOX appears to have shifted the preferences of private firms from going public to exiting the private market via acquisition by a public acquirer. In sum, these studies suggest that important costs are associated with SOX, and specifically its internal control provisions. The benefits in terms of an improved information environment and higher quality of ICOFR thus come at a cost. Put differently, despite the clear benefits of having high-quality controls in place, imposing these controls on a firm entails significant costs.

4. Remediation of internal control weaknesses

Next to the occurrence of material weaknesses in internal controls, a smaller line of research has examined the impact of remediating material weaknesses. If management or the auditor considers internal controls to be ineffective, firms have incentives to remediate the identified weaknesses to avoid potential negative capital market consequences following recurring weaknesses and the failure to address these weaknesses (Gordon & Wilford, 2012). Furthermore, research has shown that the successful remediation of internal controls is

associated with improvements in inventory tracking, sales growth, gross profit, and operating cash flows (Feng et al., 2014), as discussed in Section 3.2.

Several studies provide further insight into the link between remediation of internal control weaknesses on the one hand and accounting quality on the other hand. Ashbaugh-Skaife et al. (2008) show that firms for which the auditor confirms remediation of material weaknesses display an increase in accrual quality relative to firms that do not remediate their control problems. Moreover, firms receiving different internal control audit opinions in successive years exhibit changes in accrual quality consistent with changes in internal control quality. Along the same lines, Bédard, Hoitash, Hoitash and Westermann (2012) show that firms with material weaknesses that are not remediated have significantly higher abnormal accruals, suggesting persistent shortcomings in ICOFR. Munsif, Raghunandan, Rama and Singhvi (2011) show that firms remediating material weaknesses have lower audit fees compared to firms that continue to report material weaknesses in internal control. However, in the short term a significant audit fee premium persists compared to firms that have clean Section 404 reports in each of the sample years. Furthermore, auditors of firms failing to remediate material weaknesses are more likely to resign or deliver modified audit or going concern opinions (Hammersley, Meyers & Zhou, 2012). These findings indicate that internal control quality and accounting quality are strongly linked and that the auditor responds to the failure to remediate material weaknesses by increasing audit fees, enhancing scrutiny, or resigning. The failure to remediate material weaknesses in internal controls may consequently entail significant consequences for an organization.

Research exploring the determinants of a successful remediation of material weaknesses in internal control posits that beyond the role of the auditor, remediation is to a large extent conditional on firm governance. First, Goh (2009) shows that larger audit committees with more supervisory expertise are better able to successfully remediate defective internal controls. Board

independence and the appointment of a new CFO further facilitate timely remediation. Along the same lines, Hammersley et al. (2012) show that a successful remediation is less likely when the audit committee is small. Also in line with Goh (2009), Johnstone, Li & Rupley (2011) show that improvements in the governance structure, e.g. increased independence or more financial expertise, are positively associated with the likelihood of successfully remediating material weaknesses in internal controls. Goh (2009) and Johnstone et al. (2011) both emphasize the importance of turning around the firm's control environment following a material weakness in internal controls. At the more aggregate level, Bédard et al. (2012) construct a factor variable based on key governance characteristics (e.g., board independence, CEO duality, and audit committee expertise) and show that this governance metric significantly affects remediation, but mostly for material weaknesses linked to earnings management (e.g., year-end adjustments, non-routine entries, and revenue recognition). Corroborating evidence on board independence and CEO duality is provided by Mitra and Hossain (2011). Chan, Kleinman and Lee (2009) confirm the importance of the audit committee, showing that audit committees that meet more frequently are positively associated with remediation. The authors further show an important link with external governance, and find that successful remediation is also more likely for firms audited by Big 4 auditors.

Two studies suggest that remediation and its impact on reporting quality are conditional on the type of material weakness. Remediation is more difficult when the disclosed weaknesses are at the entity level and when firm operations are more complex (Hammersley et al., 2012). As the actions necessary to address these weaknesses are more expensive and difficult to implement, remediation will take longer and is less likely to be successful. Corroborating this reasoning, Bédard et al. (2012) show that some specific types of material weaknesses are more difficult to remediate, but that these weaknesses have a larger impact on earnings quality after remediation. Among these more difficult types of material weaknesses are accounting

reconciliations, the mixing of manual and automated processes, segregation of duties problems, and information technology issues. These two studies highlight the importance of considering different types of material weaknesses, both in terms of the ease of remediation as well as the potential impact on earnings quality.

In sum, remediating material weaknesses in internal controls is important as the market and the auditor do react to persistent failures to remediate the weaknesses. However, successfully remediating internal controls may be difficult as changes may need to happen at all levels of the organization. In line with the notion that multiple levels of the organization have an influence on ICOFR quality, the next sections will evaluate the influence of a number of different organizational bodies on ICOFR quality.

5. Executives and ICOFR quality

The primary responsibility for establishing and maintaining ICOFR lies with an organization's executives. In many countries, regulators recognize this responsibility by requiring the CEO and CFO of public companies to certify ICOFR design and effectiveness (e.g., the U.S. and Canada). Based on this, we can then expect executives' characteristics and incentives to affect the strength of the ICOFR in their firm.

Three characteristics of executives have been examined in previous research, namely age, gender, and tenure. Older executives are viewed as being more committed to the organization, more conservative and risk adverse. Similarly, female executives are argued to be more conservative and risk adverse (Lin, Wang, Chiou, & Huang, 2014). Consequently, executives with these two characteristics are expected to maintain stronger internal controls. In contrast to age and gender effects on a company's internal controls, greater executive tenure is expected to lead to entrenchment, allowing executives to extract private benefits from the firm and hence accept weaker internal control quality (Lin et al., 2014).

Furthermore, decisions regarding the level of ICOFR quality executives want to maintain can be viewed as a cost-benefit analysis, where executives weigh the costs (adverse impact on share price or reputation associated with internal control weakness disclosure) and benefits (ability to manage earnings) associated with a lax internal controls (Balsam, Jiang, & Lu, 2014). Researchers have studied the effect of executives' incentives on that decision by examining the influence of different CEO and CFO characteristics and incentives on the disclosure of internal control weaknesses.

Studying the association between CEO characteristics and the incidence of internal control weaknesses, Lin et al. (2014) finds a negative association between the occurrence of internal control weaknesses and CEO age, no association for CEO gender, and a positive association for CEO tenure. In contrast, for pre-SOX mandated audits, Ashbaugh-Skaife et al. (2007) finds no significant association between CEO tenure and the disclosure of SOX-302 internal control weaknesses.

With regard to CEO incentives, researchers have examined two dimensions: (1) ownership and (2) social capital. A higher level of executive ownership may lead to entrenchment and could have an unfavorable effect on internal control quality (Lin et al., 2014). However, as argued by Balsam et al. (2014), a higher level of executive ownership may also have a positive effect on ICOFR quality by increasing the incentive to avoid internal control weakness disclosures, which have been found to have an adverse impact on share price. Both Krishnan and Visvanathan (2007) and Balsam et al. (2014) find no association between the level of CEO ownership and internal control weaknesses. Lin et al. (2014), however, finds a positive association for their sample. Bhandari, Mammadov, Shelton, and Thevenot (2018) examine the association between CEO social capital and disclosed internal control weaknesses. Using the number of social connections as a measure of social capital, they find a negative association between the likelihood of a material weakness disclosure and the number of

connections through employment. They interpret this as an indication that CEOs maintain stronger internal controls because they care about their reputation, which could be negatively impacted by the disclosure of an internal control weakness.

With respect to CFOs, researchers have examined the effect of expertise and ownership. With regard to expertise, Krishnan (2005) studies the pre-SOX period and finds no significant association between internal control problems identified by predecessor auditors and CFO accounting expertise for a sample of companies that change auditors. Besides CFO accounting expertise, Krishnan (2005) also investigates the influence of CFO experience in another company on the presence of internal control problems. For the latter, a significant negative association is found. Focusing on the post-SOX period, Li et al. (2010) find that accounting expertise and CFO experience are both negatively associated with initial SOX-404 negative audit opinions. In contrast, Krishnan and Visvanathan (2007) find no significant association. As stated earlier, researchers investigated both the influence of CFO expertise and CFO ownership on ICOFR. With regard to the influence of ownership, Balsam et al. (2014) find a significant negative relationship between CFO equity incentives and internal control weaknesses.

Overall, the results from the studies (see Table 4) suggest that executives play a role with regard to ICOFR. The influence executives have on the quality of ICOFR varies with executive characteristics such as accounting expertise and age, as well as with incentives such as ownership and social capital. The lack of a significant association for CEO ownership and a significant association for CFO ownership (Balsam et al., 2014) also suggests that CFOs play a more important role with regard to the quality of the ICOFR than CEOs.

6. Audit committee and ICOFR quality

Although executives have the primary responsibility for establishing and maintaining ICOFR, the primary responsibility of the audit committee is to monitor internal controls (Carcello, Hermanson & Neal, 2002). In our review below, we identify studies that examine the effect of audit committee independence, competence, size, and activity on the quality of internal controls (see Tables 5 to 8).

6.1. Audit committee independence (Table 5)

With the exception of Krishnan (2005), who for the pre-SOX period finds that independent audit committees are less likely to be associated with internal control problems, most studies focus on the post-SOX period and find no significant association. This is unsurprising given that SOX requires audit committees to be fully composed of independent board members, i.e. members who are not affiliated with the firm and who do not receive any consulting fees from the firm. Even so, Zhang, Zhang and Zhou (2007, p.307) note that the Securities and Exchange Commission (SEC) may grant exemptions to this independence requirement if it deems this to be appropriate given the circumstances, and therefore some variation in audit committee independence is still present (Zhang et al., 2007; Naiker & Sharma, 2009; Hoitash, 2011).

Some studies have examined other dimensions of independence, such as compensation, equity, and ties with executives. Cullinan, Du & Jiang (2010), for example, study the association between equity-based compensation (options and stock grants) for audit committee members. They find that the likelihood of internal control weaknesses is higher in the presence of equity-based compensation and audit committee share ownership. The results for stock grants contradict the expectation that by aligning directors' interest with those of shareholders, stock grants and ownership improve monitoring. In fact, the results for stock options are

consistent with the notion that they align the interests of directors more with those of management than with those of shareholders (Cullinan et al., 2010).

Naiker and Sharma (2009) examine the effect of having a former partner affiliated with a current/past auditor of the firm as a member of the audit committee. Such audit committee members may have developed personal ties with the firm's executives, thereby reducing their independence. They find a negative association with internal control weaknesses for both affiliated and non-affiliated former partners, and contrary to the independence impairment hypotheses, they find that the reduction in the likelihood of internal control weaknesses is even lower for affiliated former partners. Furthermore, Hoitash (2011) examines the role of social ties between audit committee members and executives on the disclosure of internal control weaknesses. While such ties could be viewed as decreasing the independence of the director, Hoitash (2011) expects that because ties increase trust and collaboration, they will lead to a lower likelihood of disclosing internal control weaknesses. Consistent with this expectation, he finds less internal control weaknesses in the presence of social ties.

6.2. Audit committee competence

Having knowledge about internal controls and their role in ensuring better quality financial reporting might help audit committee members fulfill their monitoring role over ICOFR. In line with the debate over the definition of financial expertise, researchers have examined two main types of financial expertise: accounting expertise (e.g., experience as a public accountant, auditor, CFO, controller, or Chief Accounting Officer) and non-accounting expertise (e.g., experience as CEO, COO, President, or managing director). Most of the studies find a negative association between internal control weaknesses and some measure of financial expertise of the audit committee. Moreover, studies that examine both accounting and non-accounting financial expertise generally find that both types of expertise are relevant (Hoitash, Hoitash & Bédard,

2009; Hoitash, 2011; Zhang, Zhou & Zhou, 2007), although one study finds that only non-accounting – supervisory – expertise is significant (Bédard, Hoitash & Hoitash, 2014). In contrast, Naiker and Sharma (2009) examine the effect of more than two types of financial expertise (namely, expertise as inter alia a CPA partner, CPA/public accountant, CFO, a financial role and a supervisory role) and only find significant results for CPA partner experience (reducing the likelihood to report an internal control weakness) and persons with supervisory expertise serving in the audit committee (increasing the likelihood to report an internal control weakness). Moreover, it needs to be mentioned that although Hoitash et al. (2009) find that audit committee members with more financial expertise and more experience are related to a lower likelihood of disclosing Section 404 material weaknesses, Lisic, Neal, Zhang and Zhang (2016) find that the effect of audit committee members on ICOFR quality is reduced or even eliminated by CEO power. More specifically, when CEO power is low, the audit committee's financial expertise is negatively associated with the incidence of internal control weaknesses. However, as CEO power increases, this association decreases.

6.3. Audit committee size

The number of audit committee members is often viewed as a measure of the resources available to the audit committee, which is expected result in greater effectiveness (Bédard & Gendron, 2010). All of the studies investigating the role of the audit committee have tested this variable. Only two of these studies find a negative relationship (Naiker & Sharma, 2009; Hoitash, 2011), while the others studies find no significant association (see Table 7). Consistent with audit committee independence, the lack of variability in size caused by the SOX requirement of a minimum of three members could explain these results.

6.4. Audit committee activity

Finally, a number of studies have tested the effect of the number of audit committee meetings, which is often considered as a measure of audit committee diligence. Three studies find that having more meetings is positively associated with the disclosure of internal control weaknesses (Hoitash et al., 2009; Naiker & Sharma, 2009; Krishnan & Visvanathan, 2007). Zhang et al. (2007), however, finds no association (see Table 8). Thus, as proposed by Bédard and Gendron (2010), meeting frequency can also be considered a measure of a lack of effectiveness, as internal control weaknesses require more discussion with management and the auditors.

Overall, the studies above demonstrate the importance of the audit committee in monitoring internal controls and suggest that having financial expertise on the audit committee improves the monitoring of internal controls.

7. Board of directors and ICOFR quality

Besides managerial executives and the audit committee, the board of directors may also affect ICOFR quality. First, as the audit committee falls under the board of directors, the board of directors can affect audit committee effectiveness. Second, as part of its fiduciary duties with regard to risk management, the board provides some oversight on internal controls. The studies considered for this review examine the association between board strength, independence, size and level of activity on the one hand and the quality of internal controls on the other.

Using a composite score of board strength (taking into account size, independent members, tenure, meetings, and other directorships), Hoitash et al. (2009) find a negative association between the disclosure of internal control weaknesses and the composite score, suggesting that a more effective board is better at monitoring the quality of internal control. For board independence, researchers have examined classical measures such as the separation of the chair and CEO roles (Table 9) and the proportion of independent directors on the board (Table 10). The separation of chair and CEO roles increases the independence of the board and

reduces the power of the CEO, allowing the board and its committee to better monitor internal control. On the other hand, more powerful CEOs may use "their authority in order to deal with a material weakness more carefully and effectively" (Lin et al., 2014, p. 26). Table 9 shows that most of the studies that examine the separation of the chair and CEO roles find no significant association between a dual role of the CEO and ICOFR quality. However, Lin et al. (2014) find a negative association between the likelihood of a reported material weakness and the CEO also being the chairman of the board. In line with the latter finding, Bédard et al. (2014) examine the effect of having a firm's CFO serve on its board and find that this dual role of the CFO is associated with a lower likelihood of reporting internal control weaknesses. Furthermore, Hoitash (2011) examines the role of social ties between board members and executives. As for the audit committee members' ties, he finds a negative association between these ties and the disclosure of internal control weaknesses. With regard to the direct effect of the proportion of independent members on the board, results are mixed (see Table 10).

Thus, overall, when considering the studies reviewed with regard to independence, contrary to the agency theory view that executives on boards promote their interest at the expense of shareholders' interests, the results are consistent with the idea that having executives on the board increases information sharing, trust and collaboration between executives and board members.

Besides board independence, another board characteristic that is examined by some of the reviewed studies is the size of the board (see Table 11). Larger boards bring more resources to the table, but a larger sized board can also reduce the board's monitoring effectiveness. As Table 11 shows, the studies reviewed provide mixed evidence regarding the association between the presence of internal control weaknesses and board size. Finally, consistent with the findings for the audit committee, one study examines the effect of the number of board meetings (Zhang et al., 2007) and reports a positive association with the likelihood of reporting internal

control weaknesses. This suggests that the discussions regarding internal control weaknesses and their disclosures may also take place at the board level.

All in all, these results suggest that higher board of directors' quality is associated with more effective internal controls. We note that compared to audit committees, the results are weaker in terms of the number of dimensions of board quality associated with internal control weaknesses and the number of studies finding a significant association with internal control weaknesses.

8. Executives', audit committees' and boards' influence on different types of internal control weaknesses

As discussed earlier, some studies have examined two different types of material internal control weaknesses, account-specific and entity-wide weaknesses, with the latter category generally considered as being more serious and investors' reactions to the disclosure of internal control weaknesses, internal control weaknesses' effects on financial statements quality, and the costs of remediation varying depending on the type of the internal control weakness (Balsam et al., 2014).

A number of studies distinguish between the two types of internal control weaknesses in relation to executive, audit committee and board characteristics (Balsam et al., 2014; Doyle et al., 2007; Lin et al., 2014; Naiker & Sharma, 2009). Generally, they find similar results for account-specific and entity-wide internal control weaknesses (please refer to Table 12), but when they differ, most of the time the association is larger for entity-wide internal control weaknesses. For example, Lin et al. (2014) find a positive association for CEO tenure and a negative association for the dual CEO-Chair role for entity-wide internal control weaknesses but not for account-specific weaknesses. Overall, these results suggest that executives, audit committees, and boards have an effect on both types of internal control weaknesses, but that

these associations are generally stronger for entity-wide rather than account-specific internal control weaknesses.

9. Auditors and internal control

9.1. Auditor reliance on internal controls

Besides executives who have primary responsibility for internal controls, and the audit committee and board of directors who have a monitoring responsibility in relation to internal controls, external auditors also have an interest in internal controls. Since 1941, SEC regulations have required auditors to consider a company's internal controls in planning audits. According to the audit risk model, auditors reduce audit risk to an appropriate level by assessing the inherent and control risks and by correspondingly determining the amount of substantive tests to be performed and the extent of reliance on the client's internal control system. Prior research suggests that internal control reliability can change auditors' planned audit work. For example, Cohen and Kida (1989) find that auditors modify their planned audit work in response to variations in internal control reliability. Another example relates to management integrity. Kizirian, Mayhew and Sneathen (2005) find that management integrity is related to preliminary risk assessments and to the persuasiveness, timing, and extent of planned audit procedures.

In the early 1990s, however, auditors used a substantive, balance sheet audit approach rather than a controls testing approach, as the former was believed to be more efficient (O'Keefe, Simunic & Stein, 1994; Waller, 1993). With a reduction in sample sizes for tests of controls and the release of SAS No. 55 which requires auditors to obtain an understanding of internal control, reliance on internal control increased significantly in the later 1990s (Elder & Allen, 2003).

The large amount of data on internal control quality that became publicly available as a result of the enactment of SOX has generated a large amount of research studying the relation

between external auditing and internal controls. Most of these studies examine the association between either external audit fees or audit report lag on the one hand and material weaknesses in ICOFR on the other hand (table 13). These studies generally find that the presence of such weaknesses is associated with higher audit fees and higher audit report lags (e.g., Ettredge, Li & Sun, 2006; Raghunandan & Rama, 2006; Hoitash, Hoitash & Bédard, 2008). Whereas the interpretation of the latter result is relatively straightforward in suggesting that auditors expend more effort in the presence of internal control weaknesses, increased audit fees could imply that auditors either exert more effort when internal control quality is lower, charge a risk premium, or both. Jiang and Son (2015) have attempted to disentangle these effects by examining both audit fees and audit report lags. Their results suggest that in response to a decrease in audit quality auditors increase both audit effort and audit fees, and that they increase audit fees above and beyond the increase in audit effort, implying they also charge a risk premium.

Some studies have also examined the impact of remediations on fees and reporting lags, finding that these reduce both audit fees and reporting lags but that these fees and lags are still higher for remediating firms than for firms that never had material control weaknesses to begin with (Hoag & Hollingsworth, 2011; Munsif, Raghunandan & Rama, 2012). A number of studies also distinguish between account-specific and company-wide internal control weaknesses (see e.g. Lin et al. 2014; Naiker and Sharma 2009). In line with studies making this distinction for other research questions (see above), the results are generally stronger for company-wide compared to account-specific internal control weaknesses (Ettredge et al., 2006; Hoitash et al., 2008).

9.2. Factors influencing auditors' ICOFR effectiveness assessment (see also table 14)

When assessing the effectiveness of ICOFR, auditors evaluate design effectiveness, gather evidence on and assess operating effectiveness, and conclude whether and which control

deficiencies are material weaknesses. There are many factors that can influence auditors' assessed ICOFR risks. A first set of factors include auditor competence such as experience, training and knowledge (Asare, Fitzgerald, Graham, Joe, Negangard & Wolfe, 2013) and independence in relation to provision of non-audit services (NAS) (Rice & Weber, 2012; Simone, Ege & Stomberg, 2015).

With regard to auditors' competence, research suggests that auditor judgements on internal control are more homogeneous for more experienced auditors, suggesting that more competent auditors make better internal control assessments (Ashton, 1974; Ashton & Brown, 1980; Brown, 1983). However, other studies do not find that general audit experience has significant effects on auditor judgements (Brazel & Agoglia, 2007; Hamilton & Wright, 1982). In addition, auditor knowledge structure also plays an important role in their judgement process (Brazel & Agoglia, 2007). For example, Kopp and O'Donnell (2005) find that a process-focused task structure appears to help novice auditors identify control issues better than an objective-focused task structure.

This line of thoughts of organizing internal control documentation around processes triggered an additional series of studies on how to represent this process-related information. Based on the theory of cognitive fit, Kelton, Pennington, and Tuttle (2010) confirm the importance of information presentation to decision making. While this study provide a broad overview on this topic in accounting context, other studies have narrowed this down to process information specifically. More precisely, a diagrammatic versus a textual process representation are compared with each other. Dunn and Gerard (2001) were among the first to contrast both representations in relation to different auditor tasks (search, recognition, and inference). They reported findings in favour of diagrammatic representations. While comparing different process modeling techniques in the context of process level audit risk assessment Carnaghan (2006) believes that diagram-based representations are often desirable for decision-

making tasks. However, she also postulates her belief that, depending on the task, a combination might be better than one representation alone. Later studies confirm this dispersed picture. In an experiment Boritz, Borthick, and Presslee (2012) investigated the impact on control risk assessment and do not find evidence that one method outperforms the other in terms of accuracy. In terms of efficiency however, the textual representation seems to outperform the diagrammatic. Ritchi, Jans, Mendling, and Reijers (2019) also find evidence of a more complex reality in which the task at hand might demand a different process representation. Aside from the alternative process representations, a recent study on the design of internal control questionnaires (Murthy & Wheeler, 2018) reveals the increasing attention for the topic of internal control evaluation performance. In sum, research starts has started to pick up on this question, but no full understanding has yet been reached.

With regard to auditor independence, auditors are also impacted by their own incentives, such as those influenced by the provision of NAS to their audit clients. On the one hand, providing NAS might impair auditor independence and lead to a lower likelihood of disclosing ICOFR weaknesses. For example, using a sample of restating firms whose original misstatements are linked to underlying control weaknesses, Rice and Weber (2012) provide evidence that non-audit fees are negatively correlated with the probability of reporting ICOFR weaknesses. On the other hand, auditors can benefit from providing NAS due to knowledge spillovers. For example, Simone et al. (2015) find robust evidence that companies purchasing tax NAS are significantly less likely to disclose a material weakness and that this effect is due to increased overall financial reporting quality.

Besides auditor characteristics, other factors may also affect external auditors' assessment of ICOFR. A factor that has been shown to influence the assessment of ICOFR relates to managers' interaction with auditors. Under SOX 404, both managers and auditors must report on the effectiveness of ICOFR. Managers' classification of ICOFR problems can

significantly impact auditors' initial judgement of the severity of weaknesses in ICOFR if auditors are provided with managers' classifications before making their own judgement (Earley, Hoffman & Joe, 2008).

In situations where ICOFR deficiencies are identified by auditors, client managers have significant incentives to employ persuasion tactics to defend their judgments when interacting with auditors. In an experiment, Wolfe, Mauldin and Diaz (2009) find that auditors assess the significance of ICOFR deficiencies to be lower and the perceived adequacy of management's explanation to be higher for concessions than for denials with respect to deficiencies in IT controls. However, the latter does not apply to manual control deviations. With regard to persuasion tactics, Bhattacharjee and Brown (2018) suggest that when making internal control judgements, auditors are better able to identify the inappropriateness of the persuasion attempt when the tactic is used by an alumni-affiliated manager compared to an unaffiliated manager. Interestingly, auditors' professional skepticism with regard to the effectiveness of ICOFR thus increases with affiliated managers.

Other environmental factors may also impact auditors' assessed ICOFR risks, such as the presence of unrelated material weaknesses, irrelevant IT control elements, management and auditor turnover and audit market competitiveness (Gramling, O'Donnell & Vandervelde, 2013; Newton, Persellin, Wang & Wilkins, 2016; Rice & Weber, 2012; Wolfe et al. 2009).

9.3. Auditors' ICOFR assessment and SOX 404

As stated earlier, in the U.S. Section 404 of SOX requires public companies to include an assessment of the effectiveness of ICOFR in their annual report and, for companies with market capitalizations above $75 million, an auditor attestation of ICOFR. In addition, Section 302 requires all public companies to report in their quarterly or annual reports any changes in internal controls, including any corrective actions with regard to significant deficiencies and

material weaknesses. Hoitash et al. (2009) explicitly compare internal control quality under these two regulatory regimes, Section 302 and Section 404 of SOX. They find that the proportion of financial experts on the audit committee and board strength are associated with better ICOFR (implying less disclosed internal control material weaknesses), but only under SOX 404, which requires independent auditor attestation. Hence, companies with lower corporate governance quality are not detecting or disclosing their material weaknesses under Section 302, without Section 404's mandatory testing and the threat of an adverse auditor's opinion on ICOFR. This finding is important, because it suggests that without auditor involvement, the role of the board and its audit committee in overseeing the identification and reporting of internal control weaknesses is more limited. Given that only (Japan and) the U.S. have mandatory ICOFR audits, this result also suggests that conclusions for U.S. studies regarding the board of directors may not hold in other jurisdictions.

10. Non-US internal control studies

In our review thus far we have mainly discussed studies using U.S. data. Studies conducted in a non-U.S. setting are limited, mainly due to a lack of public data on internal control quality. This section highlights two of the non-U.S. studies that we have considered and reflects on their conclusions with regard to the relationships between different organizational bodies and the presence of internal control weaknesses.

Firstly, Yazawa (2015) studies the disclosure of internal control weaknesses in Japan. Japan is interesting because it is the only country other than the U.S. to have adopted a mandatory external audit of ICOFR. Although the Japanese rules are based on U.S. rules, there are some notable differences, such as the absence of direct reporting by the auditor and greater management involvement in the evaluation of ICOFR. Yazawa (2015) examines the association between CEO tenure and CEO ownership on the one hand and the probability of detecting and

disclosing internal control weaknesses on the other. He finds a significant negative association for tenure, but not for ownership. For the audit committee, he finds no significant association between the presence of internal control weaknesses and the proportion of outside members. In contrast, for the board, he finds a positive association between the presence of internal control weaknesses and the proportion of outside directors. Furthermore, a negative association is found with regard to board size. These results suggest that, as in the U.S., executives and the board of directors play a role in the detection and disclosure of internal control weaknesses in Japan.

Chen and Keung (2018) examine internal control weaknesses discovered by auditors and disclosed in the prospectus of firms listed on the Taiwan Stock Exchange for the period 2008-2012. They find a negative association with board size. Besides board size, they also investigate the association between ICOFR quality and board independence, as measured by the duality of CEO and chair functions, but they find no significant association. Furthermore, Chen and Keung (2018) also examine excess directors and officer legal liability insurance coverage. Whereas such coverage may incentivise executives to work in the shareholders' interests, it may also lead to opportunistic behaviour by executives. In line with the opportunistic behaviour explanation, Chen and Keung (2018) find a positive association with internal control weaknesses.

Besides the aforementioned two studies that investigate internal control disclosures in non-U.S. settings, a study by Baker, Biddle, Lowry and O'Connor (2018) investigating internal control reporting by Chinese U.S.-listed firms also provides some insightful thoughts. Their main findings are (1) that Chinese firms listing in the U.S. via IPOs (CIPOs) and via reverse mergers (CRMs) are more likely to report ineffective internal controls than their U.S. counterparts (albeit CIPOs to a lesser extent) and (2) that both CIPOs and CRMs are more likely to under-report weaknesses, albeit CIPOs to a lesser degree. Although this study in essence still focuses on the U.S. market and thus on the applicable SOX-regulations, it nevertheless provides

us with insights in how firms with different backgrounds implement regulations differently. More specifically, Baker et al. (2018) motivate their findings by explaining cultural differences that exist between Chinese and U.S. firms. Notwithstanding the fact that Baker et al. (2018) do not investigate which cultural effects influence the likelihood of internal control weaknesses, their research still underscores the importance of taking into account cultural backgrounds when evaluating or implementing regulations with regards to internal controls. The latter supports our argument that further research outside the U.S. is necessary.

11. Suggestions for further research

The preceding sections provide an overview of the current state of internal control research. The literature review shows that prior empirical research has predominantly focused on the drivers and consequences of material weaknesses in internal controls, as well as how executives, the audit committee, the board and auditors relate to this. Though the studies are extensive and diverse, a number of important research gaps remain unaddressed and warrant further research. In this section, we discuss potential avenues for future research.

First, we identify the complementarity between different governance mechanisms as an important avenue for further research. Specifically, extant governance research has documented the complementarities between internal and external governance mechanisms (e.g., Pae & Yoo, 2001; Zhang et al., 2007), as well as the complementarity among various internal governance mechanisms (e.g., Pizzini, Lin & Ziegenfuss, 2014). Whereas prior research has predominantly focused on the relation between the internal audit function and the auditor, the interrelation between the internal audit function, CFO, external auditor, and the audit committee remains relatively unexplored. Prior research indeed suggests the interrelatedness of these governance mechanisms, supporting among others the existence of a “governance tryad” between the CFO, the audit committee, and the external auditor (Cohen, Krishnamoorthy & Wright, 2017).

Phrased differently, the quality of internal control systems and the identification of material weaknesses herein is a joint product of various actors. This interrelation has generally been overlooked by prior research.

Second, behavioral economics suggest that individual behavior is a key determinant of economic outcomes. Though intuitive, this premise has only been tested incompletely in an internal control context. Results of experimental studies on internal controls indeed suggest that the auditor may be biased in his or her evaluation of the effectiveness of internal controls (Gramling et al., 2013; O'Donnell & Schultz, 2005). This bias may be influenced by among others experience, information, client dependence, management, risk, or documentation (e.g., Earley et al., 2008; Frankel, Johnson & Nelson, 2002; Hogan & Wilkins, 2008; Kaplan, O'Donnell & Arel, 2008; Schneider, Gramling, Hermanson & Ye, 2009). Given that a great deal of professional judgment is involved in the evaluation process, the identification of factors which cause a bias for the auditor is an important avenue for further research. If auditors mistakenly rely on ineffective internal controls, the audit will evidently be of lower quality. Conversely, not relying on a high-quality control system implies unnecessary testing and inefficient audits. Any bias affecting the audit is therefore costly, and knowledge is lacking on when biases develop, how these biases affect subsequent audit procedures, and how the effects of these biases may be mitigated.

Third, prior research has shown that the main drivers of internal control quality are firm size, complexity, risk, performance and governance (e.g., Doyle et al., 2007; Krishnan, 2005; Krishnan & Visvanathan, 2007; Lawrence et al., 2017; Rice & Weber, 2012). Subsequent material weaknesses in these internal control systems have then been shown to be associated with lower financial reporting quality and investment inefficiency (e.g., Ashbaugh-Skaife et al., 2008; Chan et al., 2008; Cheng et al., 2013; Feng et al., 2014). The bulk of research focuses on when internal controls break down, but only sparse research exists documenting the benefits of

having a stable high-quality internal control system in place for long-term operational processes. An effective internal control system permeates all layers of the organization, and should be associated with amongst others stock price crash risk, insider trading, executive pay-for-performance, or overall firm performance. Evidence in this direction is relevant given the high costs associated with the internal control provisions contained in SOX (Coates & John, 2007; Romano, 2009). Empirical research could strengthen the case for internal control evaluation by documenting the firm-specific benefits of establishing a sound internal control system, and focusing on long-term effects beyond short-term consequences of internal control failures.

An important issue in audit and internal control research is data availability. The bulk of audit studies has been executed in the U.S., and this is even more so regarding internal control research. Beyond an extensive development of archival databases, the U.S. are the only major economy demanding an explicit, external evaluation of internal controls visible to market participants. Even though auditing standards in other jurisdictions prescribe an understanding of a firm's internal control systems, the auditor's evaluation hereof is not (required to be) publicly disclosed (IAASB, 2009, ISA 315). The resulting data constraints hamper the examination of internal control quality in settings outside the U.S.. International internal control research is therefore predominantly theoretical in nature (Spira & Page, 2003), or experimental (Kachelmeier & Shehata, 1997). The lack of internal control research in different institutional settings constitutes an important research gap, as differential cultures, values, and reporting practices likely affect the design role of internal control systems, and how these systems interact with the external audit function. Much is to be learned by replicating the findings from prior research in alternative settings.

Data availability is not only a game changer for the academic researcher, but also for the internal auditor. In the context of contemporary organisations where information systems are

employed to support daily business, the generation of useful data is a given. Not only does this impact internal control evaluation (AU-C Section 315) (Curtis, Jenkins, Bedard, & Deis, 2009), it also creates opportunities to implement and test internal controls more profoundly. This is specifically evidenced by the extant literature on continuous auditing, primarily conducted in internal audit settings (Gonzalez, Sharma, & Galletta, 2012). Given the importance of business processes in the context of internal controls, analyzing process-related data to gain more (and better) assurance over controls is a particularly interesting type of data analysis (Jans, Alles, & Vasarhelyi, 2013). Process mining is a collection of data analytics techniques that support this type of analysis: starting from log data that is stored in information systems, it discovers and visualizes the true process executions, contrasted against the expected process behaviour (van der Aalst, 2016). Studies on how these techniques could be used in analytical procedures, to detect fraud, or to inspect journal entries have been conducted (Baader & Krcmar, 2018; Jans et al., 2013; Werner, 2017), but further research on how these techniques can be leveraged within the context of internal control is necessary. A first outline is presented in Jans and Hosseinpour (2019). Some examples relate to issues such as which algorithm is best suited for the purpose of internal control testing, whether the internal auditor has the necessary skills set, and what is the impact of data preparation decisions on the control evaluation.

12. Conclusion

The goal of this literature review was to provide a broad overview on our current understanding of internal control systems, their drivers, and consequences. Various stakeholders are affected by internal controls, and the myriad of studies renders it difficult to obtain a holistic view. However, a thorough understanding of how internal controls affect outcome variables such as accounting and audit quality is necessary given the increased emphasis by regulators and investors (e.g., COSO, 2013; Gordon & Wilford, 2012; ISA 315; Sarbanes-Oxley Act 2002).

We have therefore synthesized the extensive internal control literature, and conclude that although substantial progress has been made in understanding the drivers and consequences of weaknesses in internal controls, a broader view of how internal control systems jointly interact with other stakeholders such as the auditor and the audit committee is lacking. We advocate future research to take on a broader approach, and explicitly integrate internal controls in the different stages of the audit process, to address such issues as what drives an auditor's evaluation of internal controls, how this feeds back into audit procedures, and whether this translates into audit quality. Understanding the role of internal control systems in each of these steps is a necessary condition for evaluating the overall effectiveness of internal controls in an audit context.

13. References

Aalst van der, W. M. P. (2016). *Process Mining - Data Science in Action (2nd ed.)*. Springer.

Asare, S. K., Fitzgerald, B. C., Graham, L. E., Joe, J. R., Negangard, E. M., & Wolfe, C. J. (2013). Auditors' internal control over financial reporting decisions: Analysis, synthesis, and research directions. *Auditing: A Journal of Practice &Theory, 32*(1), 131–166.

Ashbaugh-Skaife, H., Collins, D. W., & Kinney Jr, W. R. (2007). The discovery and reporting of internal control deficiencies prior to SOX-mandated audits. *Journal of Accounting and Economics, 44*(1-2), 166-192.

Ashbaugh-Skaife, H., Collins, D. W., Kinney Jr, W. R., & Lafond, R. (2008). The effect of SOX internal control deficiencies and their remediation on accrual quality. *The Accounting Review, 83*(1), 217-250.

Ashbaugh-Skaife, H., Collins, D.W., Kinney Jr, W.R. & LaFond, R. (2009). The effect of SOX internal control deficiencies on firm risk and cost of equity. *Journal of Accounting Research, 47*(1), 1-43.

Ashton, R. H. (1974). An experimental study of internal control judgements. *Journal of Accounting Research, 12*(1), 143–157.

Ashton, R. H., & Brown, P. R. (1980). Descriptive modeling of auditors' internal control judgements: Replication and extension. *Journal of Accounting Research, 18*(1), 269–277.

Australian Stock Exchange (ASX) Corporate Governance Council. (2003). *Principles of good corporate governance and best practice recommendations.* Sydnex: ASX.

Baader, G., & Krcmar, H. (2018). Reducing false positives in fraud detection: Combining the red flag approach with process mining. *International Journal of Accounting Information Systems, 31*, 1-16.

Baker, R.R., Biddle, G.C., Lowry, M.R. & O'Connor, N.G. (2018). Shades of gray: Internal control reporting by Chines U.S.-listed firms. *Accounting Horizons, 32*(4), 1-30.

Balsam, S., Jiang, W., & Lu, B. (2014). Equity incentives and internal control weaknesses. *Contemporary Accounting Research, 31*(1), 178-201.

Bargeron, L.L., Lehn, K.M. & Zutter, C.J. (2010). Sarbanes-Oxley and corporate risk-taking. J*ournal of Accounting and Economics, 49*(1-2), 34-52.

Bédard, J. & Gendron, Y. (2010). Strengthening the financial reporting system: Can audit committees deliver? *International Journal of Auditing, 14*(2), 174-210.

Bedard, J.C., Hoitash, R., Hoitash, U. & Westermann, K. (2012). Material weakness remediation and earnings quality: A detailed examination by type of control deficiency. *Auditing: A Journal of Practice & Theory, 31*(1), 57-78.

Bedard, J. C., Hoitash R. & Hoitash U. (2014). Chief financial officers as inside directors. *Contemporary Accounting Research, 31*(3), 787-817.

Beneish, M.D., Billings, M.B. & Hodder, L.D. (2008). Internal control weaknesses and information uncertainty. *The Accounting Review, 83*(3), 665-703.

Bhandari, A., Mammadov, B., Shelton, A., & Thevenot, M. (2018). It Is Not Only What You Know, It Is Also Who You Know: CEO Network Connections and Financial Reporting Quality. *Auditing: A Journal of Practice & Theory, 37*(2), 27-50.

Bhattacharjee, S. & Brown, J. O. (2018). The impact of management alumni affiliation and persuasion tactics on auditors' internal control judgments. *The Accounting Review, 93*(2), 97–115.

Boritz, J. E., Borthick, A. F. & Presslee, A. (2012). The effect of business process representation type on assessment of business and control risks: Diagrams versus narratives. *Issues in Accounting Education, 27*(4), 895-915.

Bova, F., Minutti-Meza, M., Richardson, G. & Vyas, D. (2014). The Sarbanes-Oxley Act and exit strategies of private firms. *Contemporary Accounting Research, 31*(3), 818-850.

Brazel, J. F., & Agoglia, C. P. (2007). An examination of auditor planning judgements in a complex accounting information system environment. *Contemporary Accounting Research, 24*(4), 1059–1083.

Brown, P. R. (1983). Independent auditor judgment in the evaluation of internal audit functions. *Journal of Accounting Research, 21*(2), 444–455.

Carcello, J. V., Hermanson D.R., and Neal T.L. (2002). Disclosures in audit committee charters and reports. *Accounting Horizons, 16*(4), 291-304.

Carnaghan, C. (2006). Business process modeling approaches in the context of process level audit risk assessment: An analysis and comparison. *International Journal of Accounting Information Systems, 7*(2), 170-204.

Chan. K.C., Farrell, B. & Lee, P. (2008). Earnings management of firms reporting material internal control weaknesses under section 404 of the Sarbanes-Oxley Act. *Auditing: A Journal of Practice & Theory, 27*(2), 161-179.

Chan, K., Kleinman, K. & Lee, P. (2009). The impact of Sarbanes-Oxley on internal control remediation, *International Journal of Accounting & Information Management, 17* (1), 53-65

Chen, G. , Keung, E.C. (2018). Director's and officer's legal liability insurance and internal control weaknesses. *Journal of international accounting research, 17*(1), 69-86.

Cheng, M., Dhaliwal, D. & Zhang, Y. (2013). Does investment efficiency improve after the disclosure of material weaknesses in internal control over financial reporting? *Journal of Accounting and Economics, 56*(1), 1-18.

CLERP (Corporate law economic reform program) 9. (2002). *Chapter 9 Corporate Disclosure: Strengthening the financial reporting framework.* Canberra: Commonwealth of Australia

Coates, I.V. & John, C. (2007). The goals and promise of the Sarbanes-Oxley Act. J*ournal of Economic Perspectives, 21*(1), 91-116.

Cohen, J. & Kida, T. (1989). The impact of analytical review results, internal control reliability, and experience on auditors' ase of analytical review. *Journal of Accounting Research, 27*(2), 263–276.

Cohen, J., Krishnamoorthy, G. & Wright, A. (2017). Enterprise risk management and the financial reporting process: The experiences of audit committee members, CFOs and external auditors. *Contemporary Accounting Research, 34*(2), 1178-1209.

Committee of Sponsoring Organizations of the Treadway Commission (COSO). (2013). *Internal Control—Integrated Framework.* Available at: http://www.coso.org/ documents/Internal%20Control-Integrated%20Framework.pdf

Cullinan, C. P., Du. H. & Jiang W. (2010). Is compensating audit committee members with stock options associated with the likelihood of internal control weaknesses? I*nternational Journal of Auditing, 14*(3), 256-273.

Curtis, M. B., Jenkins, J. G., Bedard, J. C., & Deis, D. R. (2009). Auditors' Training and Proficiency in Information Systems: A Research Synthesis. *Journal of Information Systems, 23*(1), 79-96.

Dhaliwal, D., Hogan, C., Trezevant, R. & Wilkins, M. (2011). Internal control disclosures, monitoring, and the cost of debt. *The Accounting Review, 86*(4), 1131-1156.

Doss, M. & Jonas, G. (2004). Section 404 reports on internal control: Impact on ratings will depend on nature of material weaknesses reported. *Moody's Investors Service, Global Credit Research.*

Doyle, J., Ge, W. and McVay, S. (2007). Determinants of weaknesses in internal control over financial reporting. Journal of accounting and Economics, 44(1-2), 193-223.

Dunn, C. L., & Gerard, G. J. (2001). Auditor efficiency and effectiveness with diagrammatic and linguistic conceptual model representations. *International Journal of Accounting Information Systems, 2*(4), 223-248.

Earley, C. E., Hoffman, V. B., & Joe, J. R. (2008). Reducing management's influence on auditors' judgments: An experimental investigation of SOX 404 assessments. *The Accounting Review, 83*(6), 1461–1485.

Elder, R. J., & Allen, R. D. (2003). A longitudinal field investigation of auditor risk assessments and sample size decisions. *The Accounting Review, 78*(4), 983–1002.

Engel, E., Hayes, R.M. & Wang, X. (2007). The Sarbanes–Oxley Act and firms' going-private decisions. *Journal of Accounting and Economics, 44*(1-2), 116-145.

Enriques, L. & Volpin, P. (2007). Corporate governance reforms in continental Europe. *Journal of Economic Perspectives, 21*(1), 117-140.

Ettredge, M.L., Li, C. & Sun, L. (2006). The impact of SOX Section 404 internal control quality assessment on audit delay in the SOX era. *Auditing: A Journal of Practice and Theory, 25*(2), 1-23.

Feng, M., Li, C., McVay, S.E. & Skaife, H. (2014). Does ineffective internal control over financial reporting affect a firm's operations? Evidence from firms' inventory management. *The Accounting Review, 90*(2), 529-557.

Frankel, R.M., Johnson, M.F. & Nelson, K.K. (2002). The relation betwene auditors' fees for nonaudit services and earnings management. *The Accounting Review, 77*(s-1), 71-105.

Ge, W. & McVay, S. (2005). The disclosure of material weaknesses in internal control after the Sarbanes-Oxley Act. *Accounting Horizons, 19*(3), 137-158.

Geiger, M. A., & Taylor, P. L. (2003). CEO and CFO Certifications of Financial Information. *Accounting Horizons, 17*(4), 357-368.

Goh, B.W. (2009). Audit committees, boards of directors, and remediation of material weaknesses in internal control. *Contemporary Accounting Research, 26*(2), 549-579.

Gonzalez, G. C., Sharma, P. N., & Galletta, D. F. (2012). The antecedents of the use of continuous auditing in the internal auditing context. *International Journal of Accounting Information Systems, 13*(3), 248-262.

Gordon, L.A. & Wilford, A.L. (2012). An analysis of multiple consecutive years of material weaknesses in internal control. *The Accounting Review, 87*(6), 2027-2060.

Gramling, A. A., O'Donnell, E. F., & Vandervelde, S. D. (2013). An experimental examination of factors that influence auditor assessments of a deficiency in internal control over financial reporting. *Accounting Horizons, 27*(2), 249–269.

Hamilton, R. E., & Wright, W. F. (1982). Internal control judgments and effects of experience: Replications and extensions. *Journal of Accounting Research, 20*(2), 756–765.

Hammersley, J.S., Myers, L.A. & 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. *Review of Accounting Studies, 13*(1), 141-165.

Hammersley, J., Myers, L., & Zhou, J. (2012). The failure to remediate previously disclosed material weaknesses in internal controls. *Auditing: A Journal of Practice & Theory: May 2012,* 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? *Auditing: A Journal of Practice & Theory, 28*(2), 247-271.

Hoag, M.L. & Hollingsworth C.W. (2011). An intertemporal analysis of audit fees and Section 404 material weaknesses. *Auditing: A Journal of Practice and Theory, 30*(2), 173-200.

Hogan, C.E. & Wilkins, M.S. (2008). Evidence on the audit risk model: Do auditors increase audit fees in the presence of internal control deficiencies? *Contemporary Accounting Research, 25*(1), 219-242.

Hoitash, R., Hoitash, U. & Bedard, J.C. (2008). Internal control quality and audit pricing under the Sarbanes-Oxley Act. *Auditing: A Journal of Practice and Theory, 27*(1), 105-126.

Hoitash, U., Hoitash, R. and Bedard, J.C. (2009). Corporate governance and internal control over financial reporting: a comparison of regulatory regimes. *The Accounting Review, 84*(3), 839-867.

Hoitash, U. (2011). Should independent board members with social ties to management disqualify themselves from serving on the board? *Journal of Business Ethics, 99*(3), 399-423.

International Auditing and Assurance Standards Boards (IAASB). (2009). *International Standard on Auditing (ISA) 315: Identifying and assessing the risk of material misstatement through understanding the entity and its environment.*

Jans, M., Alles, M., & Vasarhelyi, M. (2013). The case for process mining in auditing: Sources of value added and areas of application. *International Journal of Accounting Information Systems, 14*(1), 1-20.

Jans, M., & Hosseinpour, M. (2019). How active learning and process mining can act as Continuous Auditing catalyst. *International Journal of Accounting Information Systems, forthcoming*.

Jiang, W. & Son, M. (2015). Do audit fees reflect risk premiums for control risk? *Journal of Accounting, Auditing and Finance, 30*(3), 318-340.

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. *Contemporary Accounting Research, 28*(1), 331-383.

Kachelmeier, S.J. & Shehata, M. (1997). Internal auditing and voluntary cooperation in firms: A cross-cultural experiment. *Accounting Review,* 72(3), 407-431.

Kaplan, S.E., O'Donnell, E.F., & Arel, B.M. (2008). The influence of auditor experience on the persuaviness of information provided by management. *Auditing: A Journal of Practice & Theory,* 27(1), 67-83.

Kelton, A. S., Pennington, R. R., & Tuttle, B. M. (2010). The Effects of Information Presentation Format on Judgment and Decision Making: A Review of the Information Systems Research. *Journal of Information Systems; Sarasota, 24*(2), 79-105.

Kim, Y. & Park, M.S. (2009). Market uncertainty and disclosure of internal control deficiencies under the Sarbanes–Oxley Act. *Journal of Accounting and Public Policy, 28*(5), 419-445.

Kim, G., Richardson, V. & Watson, M.W. (2018). IT does matter: The folly of ignoring IT material weaknesses. *Accounting Horizons, 32*(2), 37-55.

Kim, J.B., Song, B.Y. and Zhang, L. (2011). Internal control weakness and bank loan contracting: Evidence from SOX Section 404 disclosures. *The Accounting Review, 86*(4), 1157-1188.

Kinney Jr, W.R., Martin, R.D. and Shepardson, M.L. (2013). Reflections on a decade of SOX 404 (b) audit production and alternatives. *Accounting Horizons, 27*(4), 799-813.

Kizirian, T. G., Mayhew, B. W., & Sneathen, L. D. (2005). The impact of management integrity on audit planning and evidence. *Auditing : A Journal of Practice & Theory, 24*(2), 49–67.

Kopp, L. S., & O'Donnell, E. (2005). The influence of a business-process focus on category knowledge and internal control evaluation. *Accounting, Organizations and Society, 30,* 423–434.

Krishnan, J. (2005). Audit committee quality and internal control: An empirical analysis. *Accounting Review, 80*(2), 649-675.

Krishnan, G. V., & Visvanathan, G. (2007). Reporting internal control deficiencies in the post-Sarbanes-Oxley Era: The role of auditors and corporate governance. *International Journal of Auditing, 11*(2), 73-90.

Lawrence, A., Minutti-Meza, M. & Vyas, D. (2017). Is operational control risk informative of financial reporting deficiencies? *Auditing: A Journal of Practice and Theory, 37*(1), 139-165.

Li, P., Shu, W., Tang, Q. & Zheng, Y. (2017). Internal control and corporate innovation: evidence from China. *Asia-Pacific Journal of Accounting & Economics,* 1-21.

Li, C., Sun, L., & Ettredge, M. (2010). Financial executive qualifications, financial executive turnover, and adverse SOX 404 opinions. *Journal of Accounting and Economics, 50*(1), 93-110.

Lin, Y.-C., Wang, Y.-C., Chiou, J.-R., & Huang, H.-W. (2014). CEO characteristics and internal control quality. *Corporate Governance: An International Review, 22*(1), 24-42.

Lisic, L. L., Neal, T. L., Zhang, I. X. & Zhang, Y. (2016). CEO power, internal control quality, and audit committee effectiveness in substance versus in form. *Contemporary Accounting Research, 33*(3), 1199–1237.

Mitra, S. & Hossain, M. (2011). Corporate governance attributes and remediation of internal control material weaknesses reported under SOX Section 404. *Review of Accounting and Finance, 10*(1), 5-29.

Munsif, V., Raghunandan, K., Rama, D. V., and Singhvi, M. (2011). Audit fees after remediation of internal control weaknesses. *Accounting Horizons, 25* (1), 87-105.

Munsif, V., Raghunandan, K. & Rama, D.V. (2012). Internal control reporting and audit report lags: Further evidence. *Auditing: A Journal of Practice and Theory, 31*(3), 203-218.

Murthy, U. S., & Wheeler, P. R. (2018). The effects of decision-aid design on auditor performance in internal control evaluation tasks. *Journal of Information Systems, 32*(2), 95-113.

Naiker, V. & Sharma D.S. (2009). Former audit partners on the audit committee and internal control deficiencies. *The Accounting Review, 84*(2), 559-587.

New Zealand Exchange Limited (NZX). (2003). *Proposed listing rule changes relating to corporate governance.* Wellington: NZSE Limited.

Newton, N. J., Persellin, J. S., Wang, D., & Wilkins, M.S. (2016). Internal control opinion shopping and audit market competition. *The Accounting Review, 91*(2), 603–623.

O'Donnell, E. & Schultz Jr, J.J. (2005). The halo effect in business risk audits: Can strategic risk assessment bias auditor judgment about accountting details? *The Accounting Review, 80*(3), 921-939.

Ogneva, M., Subramanyam, K.R. and Raghunandan, K. (2007). Internal control weakness and cost of equity: Evidence from SOX Section 404 disclosures. *The Accounting Review, 82*(5), 1255-1297.

O'Keefe, T.B., Simunic, D.A., & Stein, M.T. (1994). The production of audit services: Evidence from a major public accounting firm. *Journal of Accounting Research, 32*(2), 241–261.

Pae, S. & Yoo, S. W. (2001). Strategic interaction in auditing: An analysis of auditors' legal liability, internal control system quality, and audit effort. *Accounting Review,* 76, 333–356.

PCAOB (Public company accounting oversight board). (2004). An audit of internal control over financial reporting performed in conjunction with an audit of financial statements (PCAOB release No. 2004-001). Washington, DC: PCAOB.

Pizzini, M., Lin, S. & Ziegenfuss, D.E. (2014). The impact of internal audit function quality and contribution on audit delay. *Auditing: A Journal of Practice & Theory, 34*(1), 25-58.

Prawitt, D.F., Smith, J.L. & Wood, D.A. (2009). Internal audit quality and earnings management. *The Accounting Review, 84*(4), 1255-1280.

Raghunandan, K. & Rama, D.V. (2006). SOX section 404 material weakness disclosures and audit fees. *Auditing: A Journal of Practice and Theory, 25*(1), 99-114.

Rice, S.C. & Weber, D.P. (2012). How effective is internal control reporting under SOX 404? Determinants of the (non-)disclosure of existing material weaknesses. *Journal of Accounting Research, 50*(3), 811-843.

Ritchi, H., Jans, M., Mendling, J., & Reijers, H. A. (2019). The influence of business process representation on performance of different task types. *Journal of Information Systems, forthcoming*.

Romano, R. (2004). The Sarbanes-Oxley Act and the making of quack corporate governance. *Yale LJ, 114*, 1521.

Romano, R. (2009). Does the Sarbanes-Oxley act have a future. *Yale J. on Reg., 26*, 229.

Schneider, A., Gramling, A.A., Hermanson, D.R. & Ye, Z.S. (2009). A review of academic literature on internal control reporting under SOX. *Journal of Accounting Literature, 28*(1), 1-46.

Simone, L. De, Ege, M. S., & Stomberg, B. (2015). Internal control quality: The role of auditor-provided tax services. *Accounting Review, 90*(4), 1469–1496.

Spira, L.F. & Page, M. (2003). Risk management: The reinvention of internal control and the changing role of internal audit. *Accounting, Auditing & Accountability Journal, 16*(4), 640-661.

Sun, Y. (2016). Internal control weakness disclosure and firm investment. *Journal of Accounting, Auditing & Finance, 31*(2), 277-307.

Waller, W. S. (1993). Auditors' Assessments of Inherent and Control Risk in Field Settings. *The Accounting Review, 68*(4), 783–803.

Werner, M. (2017). Financial process mining - Accounting data structure dependent control flow inference. *International Journal of Accounting Information Systems, 25*, 57-80.

Wolfe, C. J., Mauldin, E. G., & Diaz, M. C. (2009). Concede or deny: Do management persuasion tactics affect auditor evaluation of internal control deviations? *The Accounting Review, 84*(6), 2013–2037.

Yazawa, K. (2015). The incentive factors for the (non-)disclosure of material weakness in internal control over financial reporting: Evidence from J-SOX mandated audits. *International Journal of Auditing, 19*, 103-116.

Zhang, I.X. (2007). Economic consequences of the Sarbanes–Oxley Act of 2002. *Journal of accounting and economics, 44*(1-2), 74-115.

Zhang, Y., Zhou J., and Zhou N. (2007). Audit committee quality, auditor independence, and internal control weaknesses. J*ournal of Accounting and Public Policy, 26*(3), 300-327.

14. Tables

Table 1: Reviewed literature on the association between ICOFR quality and accounting quality.

Authors	Main association examined in the study	Sample size	Period	Country	Internal control quality measure	Accounting quality measure	Sign of significant associations (0 = insignificant association)
Ashbaugh-Skaife, Collins, Kinney Jr. & Lafond, 2008	The association between internal control deficiencies and accrual quality	7,778	2003-2005	USA	The disclosure of an internal control weakness	- Absolute abnormal total accruals - Absolute abnormal working capital accruals - Noisier working capital accruals	Absolute abnormal total accruals:+ Absolute abnormal working capital accruals:+ Noisier working capital accruals:+
					Besides the examined associations above, the authors also find that changes in accrual quality correlate with changes in internal control quality.		
Chan, Farell & Lee, 2008	The association between firms reporting material internal control weaknesses under Section 404 and earnings management.	1,057	2003-2004	USA	The disclosure of an internal control weakness	Discretionary accruals and absolute discretionary accruals	+
Prawitt, Smith & Wood, 2009	The association between internal audit function quality and earnings management	528	2000-2005	USA	A number measuring the quality of the internal audit function, based on different variables, such as the average number of years of internal audit experience and the percentage of time the internal audit function spends performing financial audit work	Absolute abnormal accruals	-
					Besides the association between the quality of the internal audit function and the absolute value of abnormal accruals, Prawitt et al. (2009) also investigate the relationship between the quality of the internal audit function and the tendency to just meet or miss forecasts of analysts. It is found that the quality of internal audit quality is highest for firms that just missed forecasts and lowest for firms that just met forecasts. Note that the sample used to test this relationship consisted out of 571 firm-year observations.		
Review article							
Kim, Richardson & Watson, 2018	The effect of internal control weaknesses associated with IT on the firm and its leadership	Review (N/A)			Information-technology related material weaknesses are associated with restatements, less accurate forecasts, and lower earnings quality.		

Table 1 presents the articles reviewed with regard to ICOFR quality and accounting quality. Except one study (review article), all of the studies in this table are archival studies. The validity of the results depends on the validity of data and disclosures used.

Table 2: Reviewed literature on the association between ICOFR quality and operational consequences.

Authors	Main association examined in the study	Sample size	Period	Country	Internal control quality measure	Operational consequences measure	Sign of significant associations (0 = insignificant association) or explanation
Cheng, Dhaliwal & Zhang, 2013	The association between the quality of financial reporting and investment efficiency	Max. 5,544 per year	2004-2007	USA	The disclosure of an internal control weakness	Investment efficiency based on either under- or over-investment conditional on a firm's likelihood of over- or under-investing (the higher investment efficiency, the lower the under- or over-investment)	Investment efficiency improvement after material weakness disclosure.
Feng, Li, McVay & Skaife, 2014	The association between ineffective ICOFR and firm operations (in particular inventory-related material weaknesses and firms' inventory management are reported)	8,953	2004-2009	USA	The disclosure of an inventory-related material weakness	Inventory turnover defined in two ways: (1) Inventory turnover ratio measured as cost of sales in year t divided by inventory averaged over years t-1 and t (on a FIFO basis) (2)The firm-specific inventory turnover ratio less the median inventory turnover ratio for the firm's industry	-
						The existence of inventory impairments	+
					The presence of a remediated inventory-related internal control problem	The change in inventory turnover defined in two ways: (1) Inventory turnover ratio measured as cost of sales in year t divided by inventory averaged over years t-1 and t (on a FIFO basis) (2)The firm-specific inventory turnover ratio less the median inventory turnover ratio for the firm's industry	+
					The disclosure of an internal control weakness	ROA measured as the earnings before extraordinary items in year t-1 divided by average total assets over year t-1 and year t-2	-
Sun, 2016	The association between firm investment levels and the disclosure of internal control weaknesses	16,555	2004-2012	USA	The disclosure of an internal control weakness	The sum of capital expenditures, research and development expenses, and acquisitions less sales of property, plant, and equipment during year t, scaled by total assets at the beginning of the year	-
					Note: Firm investment decreases AFTER the internal control weakness has been reported and increases AFTER the internal control weakness is remediated.		
					The disclosure of an internal control weakness	- Net capital expenditures - Acquisitions and R&D	Net capital expenditures: 0 Acquisition and R&D: -
					Note: There is no significant change in net capital expenditures. However, R&D expenses decrease after an internal control material weakness is reported and increase after an internal control material weakness remediation.		

Authors	Main association examined in the study	Sample size	Period	Country	Internal control quality measure	Operational consequences measure	Sign of significant associations (0 = insignificant association) or explanation
Lawrence, Minutti-Meza & Vyas, 2017	The association between operational control risk indicators and potential unreported financial reporting control weaknesses and financial reporting deficiencies	25,250-30,738	2005-2013	USA	The disclosure of an internal control weakness	Operational risk defined in two ways: (1) An indicator variable equal to 1 if the firm reported a privacy breach after releasing fiscal year's t-1's annual financial statements, but before releasing fiscal year t's annual financial statements, and 0 otherwise (2) An operational risk index variable based on different factors that define a firm's operational risk	+

Table 2 presents the articles reviewed with regard to ICOFR quality and operational consequences. All of the studies in this table are archival studies. The validity of the results depends on the validity of data and disclosures used.

Table 3: Reviewed literature on the association between ICOFR quality and market reactions.

Authors	Main association examined in the study	Sample size	Period	Country	Internal control quality measure	Market reaction measure	Sign of significant associations (0 = insignificant association)
Ogneva, Subramanyam & Raghunandan, 2007	The association between cost of equity and internal control weaknesses for firms that filed first-time Section 404 reports with the SEC	Max. 2,515	2004-2006	USA	The disclosure of an internal control weakness	Cost of equity	0 (only after controlling for various firm characteristics)
Beneish, Billings & Hodder, 2008	The association between Section 302 and Section 404 material weakness disclosures and abnormal returns and equity cost of capital. Section 302 and Section 404 disclosures are analyzed separately	Section 302: 330 Section 404: 383	Section 302: 2004 Section 404: 2005	USA	Disclosures under Section 302 Disclosures under Section 404	- Abnormal returns - Revisions in forecasted EPS - Cost of capital - Abnormal returns - Cost of capital	Abnormal returns: - Forecast revisions: - Cost of capital: + Abnormal returns: 0 Cost of capital: 0
Hammersley, Meyers & Shakespeare, 2008	The association between internal control weaknesses reported under Section 302 and stock price reactions	358	2003-2005	USA	The disclosure of an internal control weakness	Size adjusted returns	-
Ashbaugh-Skaife, Collins, Kinner Jr. & Lafond, 2009	The association between changes in internal control quality on the one hand and firm risk and cost of equity on the other hand	38-787 firms	2003-2005	USA	The disclosure of an internal control weakness	Cost of equity	+
Hermanson and Ye, 2009	The association of early warnings during the fiscal year under Section 302 with material weakness characteristics, litigation risk, subsequent financing, auditor characteristics, and management and governance traits	451	2004-2005	USA	The dependent variable in this study measures whether or not any internal control weaknesses disclosed in an auditor's adverse SOX 404 opinion were disclosed in earlier client SEC filings. This variable is then associated with factors mentioned in the second column. Results show that many of the factors are significant.		
Dhaliwal, Hogan, Trezevant & Wilkins, 2011	The association between a material weakness disclosure under Section 404 and a change in a firm's cost of debt	577 firms	2004-2006	USA	The disclosure of an internal control weakness	The change in a firm's credit spread around an initial Section 404 report	+
Kim, Song & Zhang, 2011	The association between different aspects of loan contracts and internal control weaknesses	3,164	2005-2009	USA	The disclosure of an internal control weakness	Loan spreads	+
Gordon & Wilford, 2012	The association between material weaknesses in internal control and the cost of equity with a focus on non-remediation and remediation.	16,946	2004-2009	USA	The presence of a material weakness reported for the first, second, third, fourth and more times	Cost of equity	+

Authors	Main association examined in the study	Sample size	Period	Country	Internal control quality measure	Market reaction measure	Sign of significant associations (0 = insignificant association)
					Note: A reduction in the number of material weakness (a partial remediation) is received positively by the market.		

Table 3 presents the articles reviewed with regard to ICOFR quality and market reactions. All of the studies in this table are archival studies. The validity of the results depends on the validity of data and disclosures used.

Table 4: Reviewed literature on the association between ICOFR quality and characteristics of executives.

Authors	Main association examined in the study	Sample size	Period	Country	Relevant measures considered	IC quality measure	Sign of significant associations (0 = insignificant association)
					CEO Characteristics		
Ashbaugh-Skaife, Collins & Kinney Jr, 2007	The association between internal control weakness disclosures prior to mandated internal control audits and economic factors that influence the likelihood that a firm has control deficiencies and managements' incentives to find and disclose weaknesses	4,810	2003-2004	USA	CEO tenure is measured both as a continuous variable as well as a binary variable that is set equal to one if the CEO tenure is less than 2 years, and zero otherwise	The disclosure of an internal control weakness	0
Krishnan & Visvanathan, 2007	The association between audit committees, auditors and the reporting of internal control deficiencies after the SOX-regulation has been implemented	180	2004-2005	USA	Indicator whether or not the CEO is also chairman		0
Lin, Wang, Chiou & Huang, 2014	The association between CEO characteristics and material weaknesses reported under SOX 404	4,374	2006-2009	USA	The logarithm of CEO age		-
					A dummy variable for the gender of the CEO that is 1 if the CEO is a female, and 0 otherwise		0
					CEO Entrenchement based on: Ownership, CEO power, Incentive Compensation and Tenure		+
Yazawa, 2015	The association between different incentive factors and the (non-)disclosure of material weaknesses	7,064	2009-2012	Japan	The natural log of management tenure		-
					Executive Ownership		
Krishnan & Visvanathan, 2007	The association between audit committees, auditors and the reporting of internal control deficiencies after the SOX-regulation has been implemented	180	2004-2005	USA	Proportion of CEO ownership	The disclosure of an internal control weakness	0
Balsam, Jiang & Lu, 2014	The association between equity incentives and material weaknesses in internal control under SOX Section 404	4,367	2004-2005	USA	Equity incentives: The natural log of the expected change in dollar value of the CEO's and CFO's stock and option portfolio to a 1 percent stock price change (sensitivity)		-
					CEO equity incentives: The natural log of the expected change in dollar value of the CEO's stock and option portfolio to a 1 percent stock price change (sensitivity)		0
					CFO equity incentives: The natural log of the expected change in dollar value of the CFO's stock and option portfolio to a 1 percent stock price change (sensitivity)		-
					Non-equity compensation: Salary and bonus measured as a percentage of total compensation		0

Authors	Main association examined in the study	Sample size	Period	Country	Relevant measures considered	IC quality measure	Sign of significant associations (0 = insignificant association)
Lin, Wang, Chiou & Huang, 2014	The association between CEO characteristics and material weaknesses reported under SOX 404	4,374	2006-2009	USA	CEO Entrenchement based on: Ownership, CEO power, Incentive Compensation and Tenure		+
Yazawa, 2015	The association between different incentive factors and the (non-)disclosure of material weaknesses	7,064	2009-2012	Japan	The ratio of shares held by management (the CEO)		0
Social Capital							
Bhandari, Mammadov, Shelton & Thevenot, 2018	The association between CEO's external connections with other executives and directors and enhanced financial reporting quality	5,611	2002-2014	USA	The natural logarithm of the number of total CEO connections with other CEOs and directors	The disclosure of an internal control weakness	-
CFO Experience							
Krishnan, 2005	The association between audit committee quality and the quality of corporate internal control	256	1994-2000 (Pre-SOX)	USA	The presence of personnel, CFO or Controller or CAO, with a CPA certification or previous experience in a CPA firm	The disclosure of an internal control weakness	0
					A variable indicating whether the CFO (or controller or CAO) has had prior experience in one or more of these positions in other employment		-
Krishnan & Visvanathan, 2007	The association between audit committees, auditors and the reporting of internal control deficiencies after the SOX-regulation has been implemented	180	2004-2005	USA	1 if the CFO has previous experience in a similar capacity with another company		0
					1 if the CFO has CPA certification or previous experience in public accounting, 0 otherwise		0
Li, Sun & Ettredge, 2010	The associations between CFOs' professional qualifications, SOX Section 404 internal control weakness, CFOs' turnover, CFOs' qualification improvement, and correction of material weaknesses	342-2,478	2005	USA	1 if a company's CFO in 2004 had a CPA license or has worked in a public accounting firm, 0 otherwise		-
					Natural logarithm of the number of years the CFO has held a CFO position, as of 2004		-

Table 4: presents the articles reviewed with regard to executives and their influence on ICOFR quality. All articles considered investigate the association between different executives' characteristics and the presence of internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 5: Reviewed literature on the association between audit committee member's independence and ICOFR quality.

Authors	Main association examined in the study	Sample size	Period	Country	AC independence measure	IC quality measure	Significant associations (0 implies an insignificant association)
Proportion of independent audit committee members							
Krishnan, 2005	The association between audit committee quality and the quality of corporate internal control	256	1994-2000 (Pre-SOX)	USA	Proportion of independent outside members on the audit committee	The disclosure of an internal control weakness	-
Zhang, Zhou & Zhou, 2007	The association between audit committee quality, auditor independence, and the disclosure of internal control weaknesses after the implementation of SOX	416	2004-2005	USA	Percentage of independent directors on the audit committee.		0
Naiker & Sharma, 2009	The association between internal control deficiencies reported under SOX Section 404 and the presence of former audit partners on the audit committee who are affiliated and unaffiliated with the firm's external auditor	1,225	2004	USA	Proportion of audit committee members who are independent		0
Hoitash, 2011	The association between social ties between board members and management and the ability of board members to monitor management on behalf of shareholders	2,956-3,525	2004-2005	USA	An indicator variable equal to 1 if all the audit committee members are independent, and 0 otherwise		0
Yazawa, 2015	The association between different incentive factors and the (non-)disclosure of material weaknesses	7,064	2009-2012	Japan	The ratio of outside Audit & Supervisory Board Members to the Audit & Supervisory Board		0
Other measures of independence							
Naiker & Sharma, 2009	The association between internal control deficiencies reported under SOX Section 404 and the presence of former audit partners on the audit committee who are affiliated and unaffiliated with the firm's external auditor	1,225	2004	USA	The presence of a with the external auditor affiliated and/or unaffiliated former partner in the audit committee	The disclosure of an internal control weakness	-
Cullinan, Du & Jiang, 2010	The association between stock option plans for audit committee members and internal control weaknesses	243 (pairs)	2004-2005	USA	The presence of a stock option plan and/or share compensation for audit committee members		+
					The number of stock options held by audit committee members divided by the total shares outstanding		+
Hoitash, 2011	The association between social ties and the likelihood of material weaknesses in internal	2,956-3,525	2004-2005	USA	The presence of social ties between managers and independent directors serving on the audit committee		-

Authors	Main association examined in the study	Sample size	Period	Country	AC independence measure	IC quality measure	Significant associations (0 implies an insignificant association)
	controls and the likelihood of financial restatements						
					Review article		
Bédard & Gendron, 2010	This paper concerns a review of inter alia audit committee characteristics and their effects on financial reporting (and internal control)	Review of articles published between 1994 and 2008	17 studies are reviewed that examine the association between independence and effectiveness (internal control). For internal control, the rate of positive associations between independence and effectiveness amounts to 71%.				

Table 5 presents the articles reviewed with regard to audit committee independence. All articles considered investigate the association between audit committee independence and the presence of internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 6: Reviewed literature on the association between audit committee member's expertise and ICOFR quality.

Authors	Main association examined in the study	Sample size	Period	Country	AC expertise measure	IC quality measure	Significant associations (0 implies an insignificant association)
Krishnan, 2005	The association between audit committee quality and the quality of corporate internal control.	256	1994-2000 (Pre-SOX)	USA	The number of audit committee members with financial expertise	The disclosure of an internal control weakness	-
Krishnan & Visvanathan, 2007	The association between audit committees, auditors and the reporting of internal control deficiencies after the SOX-regulation has been implemented	180	2004-2005	USA	The proportion of directors in the committee who are deemed as "accounting or non-accounting financial experts"		-
Zhang, Zhou & Zhou, 2007	The association between audit committee quality, auditor independence, and the disclosure of internal control weaknesses after the implementation of SOX	416	2004-2005	USA	- The percentage of financial experts on the audit committee - The percentage of accounting financial experts on the audit committee - The percentage of non-accounting financial experts on the audit committee		Financial experts: - Accounting financial experts: - Non-accounting financial experts: -
Hoitash, Hoitash & Bédard, 2009	The association between corporate governance and disclosures of material weaknesses in ICOFR	5,480	2004-2006	USA	- Proportion of accounting experts serving on the audit committee - Proportion of supervisory experts serving on the audit committee		Accounting experts: - Supervisory experts: - These associations are not detectable using Section 302 reports.
Naiker & Sharma, 2009	The association between internal control deficiencies reported under SOX Section 404 and the presence of former audit partners on the audit committee who are affiliated and unaffiliated with the firm's external auditor.	1,225	2004	USA	The presence of members: - Who are affiliated and non-affiliated partners - With specific accounting experience - With potential accounting experience (e.g. CFO's) - With finance experience - With supervisory expertise		Affiliated partners: - Non-affiliated partners: - Specific accounting experience: 0 Potential accounting experience:0 Finance experience:0 Supervisory experience: +
Cullinan, Du & Jiang, 2010	The association between stock option plans for audit committee members and internal control weaknesses.	243 (pairs)	2004-2005	USA	Proportion of finance experts on the audit committee		-
Hoitash, 2011	The association between social ties and the likelihood of material weaknesses in internal controls and the likelihood of financial restatements.	2,956-3,525	2004-2005	USA	- Percentage accounting experts serving on the audit committee - Percentage of supervisory serving on the audit committee - An indicator variable equal to 1 if the company has an audit committee member that serves on at-least two distinct audit committees, and zero otherwise		Accounting experts: - Supervisory experts: - Serving multiple audit committees: -

Authors	Main association examined in the study	Sample size	Period	Country	AC expertise measure	IC quality measure	Significant associations (0 implies an insignificant association)
Balsam, Jiang & Lu, 2014	The association between equity incentives and material weaknesses (MWs) in internal control under SOX Section 404.	4,367	2004-2005	USA	- Proportion of audit committee members with financial expertise		0
Bédard, Hoitash & Hoitash, 2014	The association between the inclusion of a company's CFO on its board of directors with financial reporting quality and with CFO entrenchment	7,034	2004-2007	USA	- Proportion of audit committee members who are accounting financial experts - Proportion of audit committee members who are supervisory financial experts		Accounting financial experts: 0 Supervisory financial experts: -
Bhandari, Mammadov, Shelton & Thevenot, 2018	The association between CEO's external connections with other executives and directors and financial reporting quality.	5,611	2002-2014	USA	Proportion of financial experts on the audit committee		0
Review article							
Bédard & Gendron, 2010	This paper concerns a review of inter alia audit committee characteristics and their effects on financial reporting (and internal control).	Review of articles published between 1994 and 2008	12 studies are reviewed that examine the association between measures of competence and effectiveness (internal control). For internal control, the rate of positive associations between competences and effectiveness amounts to 67%.				

Table 6 presents the articles reviewed with regard to audit committee expertise. All articles considered investigate the association between some measure of audit committee expertise and the presence of internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 7: Reviewed literature on the association between audit committee size and ICOFR quality.

Authors	Main association examined in the study	Sample size	Period	Country	AC size measure	IC quality measure	Significant associations (0 implies an insignificant association)
Krishnan, 2005	The association between audit committee quality and the quality of corporate internal control	256	1994-2000 (Pre-SOX)	USA	A dummy variable coded 1 if the number of members is three or more, and 0 otherwise	The disclosure of an internal control weakness	0
Krishnan & Visvanathan, 2007	The association between audit committees, auditors and the reporting of internal control deficiencies after the SOX-regulation has been implemented	180	2004-2005	USA	The number of directors in the audit committee		0
Zhang, Zhou & Zhou, 2007	The association between audit committee quality, auditor independence, and the disclosure of internal control weaknesses after the implementation of SOX	416	2004-2005	USA	The natural logarithm of audit committee size measured as the number of AC members		0
Hoitash, Hoitash & Bédard, 2009	The association between corporate governance and disclosures of material weaknesses in internal control over financial reporting	5,480	2004-2006	USA	Number of members serving on the audit committee in 2004		0
Naiker & Sharma, 2009	The association between internal control deficiencies reported under SOX Section 404 and the presence of former audit partners on the audit committee who are affiliated and unaffiliated with the firm's external auditor	1,225	2004	USA	1 if the size of the audit committee is larger than the sample median, and 0 otherwise		-
Cullinan, Du & Jiang, 2010	The association between stock option plans for audit committee members and internal control weaknesses	243 (pairs)	2004-2005	USA	Log of the number of directors on the audit committee		0
Hoitash, 2011	The association between social ties and the likelihood of material weaknesses in internal controls and the likelihood of financial restatements	2,956-3,525	2004-2005	USA	Number of members serving on the audit committee		-
Balsam, Jiang & Lu, 2014	The association between equity incentives and material weaknesses (MWs) in internal control under SOX Section 404	4,367	2004-2005	USA	Log of the number of the audit committee members		0
Bédard, Hoitash & Hoitash, 2014	The association between the inclusion of a company’s CFO on its board of directors with financial reporting quality and with CFO entrenchment	7,034	2004-2007	USA	Number of audit committee members		0
Bhandari, Mammadov, Shelton & Thevenot, 2018	The association between CEO’s external connections with other executives and directors and financial reporting quality	5,611	2002-2014	USA	Number of audit committee members		0

Review Article			
Bédard & Gendron, 2010	This paper concerns a review of inter alia audit committee characteristics and their effects on financial reporting (and internal control).	Review of articles published between 1994 and 2008	Audit committee size does not seem to be important for internal control effectiveness.

Table 7 presents the articles reviewed with regard to audit committee size. All articles considered investigate the association between some audit committee size and the presence of internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 8: Reviewed literature on the association between the number of audit committee meetings and ICOFR quality.

Authors	**Main association examined in the study**	**Sample size**	**Period**	**Country**	**Number of AC meetings measure**	**IC quality measure**	**Significant associations (0 implies an insignificant association)**
Krishnan & Visvanathan, 2007	The association between audit committees, auditors and the reporting of internal control deficiencies after the SOX-regulation has been implemented	180	2004-2005	USA	Number of audit committee meetings	The disclosure of an internal control weakness	+
Zhang, Zhou & Zhou, 2007	The association between audit committee quality, auditor independence, and the disclosure of internal control weaknesses after the implementation of SOX	416	2004-2005	USA	Natural logarithm of the number of audit committee meetings		0
Hoitash, Hoitash & Bédard, 2009	The association between corporate governance and disclosures of material weaknesses in internal control over financial reporting	5,480	2004-2006	USA	Number of meetings held by the audit committee for the fiscal year 2004		+
Naiker & Sharma, 2009	The association between internal control deficiencies reported under SOX Section 404 and the presence of former audit partners on the audit committee who are affiliated and unaffiliated with the firm's external auditor	1,225	2004	USA	1 if the number of audit committee meetings held was more than the median number of meetings held across the full sample, and 0 otherwise		+
Review article							
Bédard& Gendron, 2010	This paper concerns a review of inter alia audit committee characteristics and their effects on financial reporting (and internal control).	Review of articles published between 1994 and 2008		Studies are reviewed that examine the association between the number of audit committee meetings and effectiveness. 30% of the analyses find a positive association between the number of audit committee meetings and effectiveness. 2% find a negative association, while 68% find no significant association. The results are relatively similar for the different components of effectiveness (including internal control effectiveness) considered.			

Table 8 presents the articles reviewed with regard to the number of audit committee meetings held. All articles considered investigate the association between the number of audit committee meetings held and the presence of internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 9: Reviewed literature on the association between dual roles of CEOs/CFOs and ICOFR quality.

Authors	Main association examined in the study	Sample size	Period	Country	Duality Measure	IC quality measure	Sign of associations (0 = insignificant association)
Krishnan and Visvanathan, 2007	The association between audit committees, auditors and the reporting of internal control deficiencies after the SOX-regulation has been implemented	180	2004-2005	USA	Measure indicating whether or not the CEO is also the chairman of the board	The disclosure of an internal control weakness	0
Naiker & Sharma, 2009	The association between internal control deficiencies reported under SOX Section 404 and the presence of former audit partners on the audit committee who are affiliated and unaffiliated with the firm's external auditor	1,225	2004	USA	1 if the CEO of the firm is also the board chairman, and 0 otherwise		0
Hoitash, 2011	The association between social ties and the likelihood of material weaknesses in internal controls and the likelihood of financial restatements	2,956-3,525	2004-2005	USA	An indicator variable equal to 1 if the CEO is also the chairman of the board, and zero otherwise		0
Lin, Wang, Chiou & Huang, 2014	The association between CEO characteristics and material weaknesses reported under SOX 404	4,374	2006-2009	USA	An indicator variable that is 1 if the CEO is also the chairperson of the board, and 0 otherwise		-
Bédard, Hoitash & Hoitash, 2014	The association between the inclusion of a company's CFO on its board of directors with financial reporting quality and with CFO entrenchment	7,034	2004-2007	USA	An indicator variable=1 if the CFO serves on the board of directors, and 0 otherwise		-
Chen & Keung (2018)	The association between excess D&O coverage and the effectiveness of internal controls	1,036	2008-2012	Taiwan	An indicator variable equal to 1 if the CEO also serves as board chair, and 0 otherwise		0

Table 9 presents the articles reviewed with regard to CEOs and/or CFOs having dual roles. All articles considered investigate the association between the dual roles held by CEOs and/or CFOs and the presence of internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 10: Reviewed literature on the association between board independence and ICOFR quality.

Authors	Main association examined in the study	Sample size	Period	Country	Board Independence Measure	IC quality measure	Sign of associations (0 = insignificant association)
Krishnan, 2005	The association between audit committee quality and the quality of corporate internal control	256	1994-2000 (Pre-SOX)	USA	Proportion of independent outside members on the board, excluding the audit committee	The disclosure of an internal control weakness	0
Krishnan & Visvanathan, 2007	The association between audit committees, auditors and the reporting of internal control deficiencies after the SOX-regulation has been implemented	180	2004-2005	USA	Board independence measure not defined		0
Zhang, Zhou & Zhou, 2007	The association between audit committee quality, auditor independence, and the disclosure of internal control weaknesses after the implementation of SOX	416	2004-2005	USA	Percentage of outside directors on the board		0
Naiker & Sharma, 2009	The association between internal control deficiencies reported under SOX Section 404 and the presence of former audit partners on the audit committee who are affiliated and unaffiliated with the firm's external auditor	1,225	2004	USA	Proportion of board members, excluding audit committee members, who are independent		0
Cullinan, Du & Jiang, 2010	The association between stock option plans for audit committee members and internal control weaknesses	243 (pairs)	2004-2005	USA	Proportion of independent members on the board		-
Hoitash, 2011	The association between social ties and the likelihood of material weaknesses in internal controls and the likelihood of financial restatements	2,956-3,525	2004-2005	USA	The percentage of independent directors on the board		-
					Several indicator variables indicating whether there is/was at least one tie between inside board members to independent board members and the type of tie (the independent member involved serving on the audit committee or not)		-
Balsam, Jiang & Lu, 2014	The association between equity incentives and material weaknesses in internal control under SOX Section 404	4,367	2004-2005	USA	Proportion of independent members on the board		0
Bédard, Hoitash & Hoitash, 2014	The association between the inclusion of a company's CFO on its board of directors with financial reporting quality and with CFO entrenchment	7,034	2004-2007	USA	An indicator variable=1 for boards where the number of insiders is smaller than the sample median		-
Yazawa, 2015	The association between different incentive factors and the (non-)disclosure of material weaknesses	7,064	2009-2012	Japan	The ratio of outside directors to the board of directors		+

Authors	Main association examined in the study	Sample size	Period	Country	Board Independence Measure	IC quality measure	Sign of associations (0 = insignificant association)
Bhandari, Mammadov, Shelton & Thevenot, 2018	The association between CEO's external connections with other executives and directors and enhanced financial reporting quality	5,611	2002-2014	USA	Proportion of independent members on the board of directors		0

Table 10 presents the articles reviewed with regard to board independence. All articles considered investigate the association between board independence and the presence of internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 11: Reviewed literature on the association between board size and ICOFR quality.

Authors	Main association examined in the study	Sample size	Period	Country	Board Size Measure	IC quality measure	Sign of associations (0 = insignificant association)
Zhang, Zhou & Zhou, 2007	The association between audit committee quality, auditor independence, and the disclosure of internal control weaknesses after the implementation of SOX	416	2004-2005	USA	The natural logarithm of board size measured as the number of directors on the board	The disclosure of an internal control weakness	-
Cullinan, Du & Jiang, 2010	The association between stock option plans for audit committee members and internal control weaknesses	243 (pairs)	2004-2005	USA	Log of the number of directors on the board (from proxy statement)		0
Hoitash, 2011	The association between social ties and the likelihood of material weaknesses in internal controls and the likelihood of financial restatements	2,956-3,525	2004-2005	USA	Number of members serving on the board of directors (Board analyst)		+
Balsam, Jiang & Lu, 2014	The association between equity incentives and material weaknesses in internal control under SOX Section 404	4,367	2004-2005	USA	Log of the number of directors on the board (source Equilar)		0/-
Yazawa, 2015	The association between different incentive factors and the (non-)disclosure of material weaknesses	7,064	2009-2012	Japan	The natural log of the number of company board members		-
Chen & Keung, 2018	The association between excess D&O coverage and the effectiveness of internal controls	1,036	2008-2012	Taiwan	The natural log of the number of directors		-

Table 11 presents the articles reviewed with regard to board size. All articles considered investigate the association between board size and the presence of internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 12: Reviewed literature on types of internal control weaknesses in relation to executive, audit committee and board characteristics.

Authors	Original table	Measure involved	IC quality measure	Sign of associations overall (table 4) (0 = insignificant association)	Company level weakness	Account specific weakness
Executives – Types of internal control weaknesses (please refer to table 4 for the overall conclusions)						
Balsam, Jiang & Lu, 2014	4	Equity incentives: The natural log of the expected change in dollar value of the CEO's and CFO's stock and option portfolio to a 1 percent stock price change (sensitivity)	The disclosure of an internal control weakness	-	-	0
Lin, Wang, Chiou & Huang, 2014		The logarithm of CEO age		-	-	-
		A dummy variable for the gender of the CEO that is 1 if the CEO is a female, and 0 otherwise		0	0	0
		CEO Entrenchment based on: Ownership, CEO power, Incentive compensation and tenure		+	+	+
		Please note: With regards to CEO entrenchment, that when this variable is split into its sub-components such as tenure, different relationships might exists between an individual component and the likelihood of reporting an internal control material weakness. CEO entrenchment is in fact just a summarizing variable. When looking, for example, at tenure, it can be retrieved that a positive association seems to exist with company level weaknesses. However, no significant association can be found with account specific weaknesses.				
Audit committee member's independence and ICOFR quality (please refer to table 5 for the overall conclusions)						
Naiker & Sharma, 2009	5	The presence of a with the external auditor unaffiliated former partner in the audit committee	The disclosure of an internal control weakness	-	-	0
		The presence of a with the external auditor affiliated former partner in the audit committee		-	-	-
Audit committee member's expertise and ICOFR quality (please refer to table 6 for the overall conclusions)						
Naiker & Sharma, 2009	6	The presence of members with specific accounting experience	The disclosure of an internal control weakness	0	0	0
		The presence of members with potential accounting experience		0	0	0
		The presence of members with finance experience		0	0	0
		The presence of members with supervisory experience		+	+	0
Balsam, Jiang & Lu, 2014	6	Proportion of audit committee members with financial expertise		0	0	0
Audit committee size and ICOFR quality (please refer to table 7 for the overall conclusions)						
Balsam, Jiang & Lu, 2014	7	Log of the number of audit committee members	The disclosure of an internal control weakness	0	0	-
Dual roles of CEOs/CFOs and ICOFR quality (please refer to table 9 for the overall conclusions)						
Lin, Wang, Chiou & Huang, 2014	9	An indicator variable that is 1 if the CEO is also the chairperson of the board, and 0 otherwise	The disclosure of an internal control weakness	-	-	0
Board independence and ICOFR quality (please refer to table 10 for the overall conclusions)						

Authors	Original table	Measure involved	IC quality measure	Sign of associations overall (table 4) (0 = insignificant association)	Company level weakness	Account specific weakness
Balsam, Jiang & Lu, 2014	10	An indicator variable equal to 1 for boards where the number of insiders is smaller than the sample median	The disclosure of an internal control weakness	0	0	0
Board size and ICOFR quality (please refer to table 11 for the overall conclusions						
Balsam, Jiang & Lu, 2014	11	Log of the number of directors on the board	The disclosure of an internal control weakness	0/mixed results	0	0
Prior Untabulated Findings						
Doyle, Ge & McVay, 2007	Untabulated	Firm size proxied by the market value of equity	The disclosure of an internal control weakness	-	0	-
		Firm age proxied by the years the firm has CRSP data		-	-	0
		Financial health proxied by a loss indicator variable and a proxy for the chance of bankruptcy		+	+	0
		Financial reporting complexity based on the number of SPEs and segments reported. Next to that, the existence of foreign currency translations are taken into account.		+	+	+
		Rapid growth proxied by M&A expenditures and sales growth		+	0	+
		Restructuring charges		+	0	+
		A measure of corporate governance		0	Not available	

Table 12 presents the articles reviewed on types of internal control weaknesses in relation to executive, audit committee and board characteristics. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures. For Balsam, Jiang & Lu (2014) it needs to be mentioned that only the difference in association between on the one hand company-wide material weaknesses and no material weaknesses and other the other hand account-specific material weaknesses and no material weaknesses are considered. For Doyle, Ge & McVay (2007) it needs to be mentioned that these variables are not defined in any earlier table. The study focuses on the USA, based on the fact that the authors look at reported internal controls. The time period considered spans from 2002 to 2005.

Table 13: Reviewed literature on the association between ICOFR quality and audit fees/audit report lags.

Authors	Main association examined in the study	Sample size	Period	Country	ICOFR quality measure	Audit fees/Audit report lags measure	Sign of associations (0 = insignificant association)
Ettredge, Li & Sun, 2006	The association between internal control quality and audit delay following the SOX act	2,344 firms over two years	2003-2004	USA	The disclosure of an internal control weakness	The number of calendar days from fiscal year-end to the date of the auditor's report	+
					The presence of a general material weakness		+
					The presence of a specific material weakness		+
					Note: Companies with general ICOFR material weaknesses are associated with longer audit delays than those with specific material weaknesses.		
Raghunandan & Rama, 2006	The association between internal control disclosures made under Section 404 and audit fees	660	2004 (file report 2005)	USA	The disclosure of an internal control weakness	Natural logarithm of audit fees	+
					The presence of a systematic material weakness		+
					The presence of a non-systematic material weakness		+
					Note: Audit fees are higher when there is an internal control weakness disclosure. Independent on the type of weakness. There seems to be no difference between the influence of systematic material weaknesses and non-systematic material weakness on audit fees.		
Hoitash, Hoitash & Bedard, 2008	The association between problems in internal control over financial reporting disclosed under Sections 302 and 404 and audit pricing	2,501	2003: Section 302 2004-2005: Section 404	USA	The disclosure of a control weakness (404 period)	Natural logarithm of audit fees in thousands	+
					The disclosure of a material control weakness (404 period)		+
					The disclosure of a significant control weakness (404 period)		0
					The disclosure of a general control weakness (404 period)		+
					The disclosure of a account-specific control weakness (404 period)		+
					Note: General control weaknesses have a larger effect on audit fee, than account-specific control weaknesses.		
					Note 2: During the 404-period fees are also higher for companies that do not report an internal control problem. Furthermore, when internal control problems are discovered in Section 404 engagements the risk adjustment (audit fee increase) is lower than when internal control problems are discovered in Section 302 engagements.		
Jiang & Son, 2015	The association between control risk and risk premiums controlled by audit effort (measured as audit delay)	26,940	2004-2011	USA	t-1: Unqualified SOX 404 opinion t: Adverse SOX 404 opinion	Changes in audit delays, measures as the number of days between the fiscal year-end and the audit report date	+
					t-1: Adverse SOX 404 opinion t: Unqualified SOX 404 opinion		-
					t-1 and t: Adverse SOX 404 opinion		-
					t-1: Unqualified SOX 404 opinion t: Adverse SOX 404 opinion	Changes in the natural logarithm of audit fees (controlled for audit delay)	+
					t-1: Adverse SOX 404 opinion t: Unqualified SOX 404 opinion		-
					t-1 and t: Adverse SOX 404 opinion		+
					Note: The above findings indicate that auditors adjust both their effort (as measured by audit delay) and risk premiums (as measured by audit fees).		
					Note 2: Besides, it is also found that auditors put more effort in audits of firms with company-level control weaknesses, than in audits of firms with account-specific weaknesses. Likewise, upon remediation, the reduction in audit effort is greater for firms that earlier reported general internal control problems than account-specific problems. Moreover, even when partial		

Authors	Main association examined in the study	Sample size	Period	Country	ICOFR quality measure	Audit fees/Audit report lags measure	Sign of associations (0 = insignificant association)
					remediation occurs auditors adjust their effort. When there is no change in the severity of an internal control weakness from one year to the other, audit effort does not seem to change.		
					Note 3: Besides, it is also found that auditors increase audit fees of firms with company-level control weaknesses more than audit fees of firms with account-specific weaknesses. Upon remediation, auditors reduce audit fees for both types of weakness. However, there is no difference in the size of reduction. When weakness change from a more severe to a less severe type, fees do not change. However, when weaknesses become more severe, fees are adjusted upwards. When a weakness is present, and there is no change over two consecutive years, auditors charge higher risk premiums.		
Hoag & Hollingsworth, 2011	The association between audit fees and the presence and remediation of an internal control weakness reported under Section 404.	13,670-13,788	2004-2007	USA	The first adverse opinion reported by a company	The natural log of audit fees	+
					Consecutive adverse opinions		+
					First year after remediation		+
					Second year after remediation		+
					Third year after remediation		+
					Note: The level of audit fees in the year the first adverse opinion is reported and the first year after remediation, are not significantly different. The level of audit fees in the second and third year after remediation are, however, significantly lower than the year of the first adverse opinion. Nevertheless, they are still higher than the audit fees reported for firms that never reported a material weakness. Companies that do not remediate their weakness, though, experience higher audit fees than firms that reported a weakness for the first time, or firms remediating a weakness.		
					The first adverse opinion reported by a company	Changes in the natural log of audit fees	+
					Consecutive adverse opinions		0
					First year after remediation		-
					Second year after remediation		-
					Third year after remediation		0
					Note: Audit fees increase in the year a firm receives its first adverse opinion. The change in audit fees in the first year after remediation does not lead to a significantly lower level of audit fees compared to firms reporting their weakness for the first time. The levels of audit fees only become observably lower in the second and third year after remediation. In general, there is no significant change in audit fees for companies reporting consecutive adverse opinions, indicating that consecutive reported problems do not provide much new information to auditors and that firms reporting consecutive adverse opinions do not receive any further audit fee increases, but also not benefit from decreases resulting from remediation.		
					Note 2: Both companies with company-level and account-specific weaknesses pay larger audit fees than companies reporting no weakness. However, companies with a company-level weakness pay a larger premium than companies with an account-specific weakness.		
Munsif, Raghunandan & Rama, 2012	The association between internal control weaknesses and audit report lag	2,839 per year	2008-2009	USA	The disclosure of an internal control weakness	Number of calendar days between fiscal year-end to date of the audit report	+
					(Non-)Accelerated filers: The disclosure of an entity-level or account-level material weakness in 2008		+
					Note: No difference in the magnitude of the audit delay for entity-level and account-level material weaknesses in 2008.		
					(Non-)Accelerated filers: The disclosure of an entity-level or account-level material weakness in 2009	Number of calendar days between fiscal year-end to date of the audit report	+
					Note: In 2009, entity-level material weaknesses lead to larger audit delays than account-level material weaknesses for accelerated filers. However, no difference is found in the magnitude of the audit delay for entity-level and account-level material weaknesses in 2009 for non-accelerated filers.		

Authors	Main association examined in the study	Sample size	Period	Country	ICOFR quality measure	Audit fees/Audit report lags measure	Sign of associations (0 = insignificant association)
					The disclosure of an internal control weakness in 2008, but remediation in 2009	Number of calendar days between fiscal year-end to date of the audit report	+
					The disclosure of an internal control weakness in both 2008 and 2009		+
					Note: Remediating firms continue to have larger audit report lags compared to firms that never reported an internal control weakness. For accelerated filers, remediation leads to a significant reduction in audit report lag. However, for non-accelerated filers there is no significant difference.		

Table 13 presents the articles reviewed with regard to audit fee and audit lags in relation to internal control weaknesses. All of the studies in this table are archival studies based on public disclosures of internal control weaknesses by firms and/or their auditors. The validity of the results depends on the validity of these disclosures.

Table 14: Reviewed literature on the factors influencing auditor's ICOFR effectiveness assessment.

Authors	Main topic of the study	Study type	Sample size	Period	Country	Conclusion relevant for this review article
AUDITOR CHARACTERISTICS						
AUDITOR CHARACTERISTICS - Independence						
Rice & Weber, 2012	Examining the determinants of internal control reporting decisions under SOX Section 404 by looking at restating firms. Non-audit fees is one of the variables considered.	Archival	488	2009 (misstatements periods after 2004)	USA	Non-audit fees are negatively associated with the likelihood of reporting an ICOFR weakness.
Simone, Ege & Stomberg, 2015	Examining the association between auditor-provided tax services (tax NAS) and internal control quality.	Archival	32,048	2004-2012	USA	Tax NAS are associated with better internal control quality. This result is not due to auditor independence impairment, because there is no significant association between restated internal control opinions and tax NAS.
AUDITOR CHARACTERISTICS - Experience, knowledge and training						
Ashton, 1974	Investigating the evidence-evaluation function of independent auditing with respect to internal control. Consistency of judgments and the perceived importance of indicators to the judgment were especially considered.	Experimental	63	N/A Experimental		Auditor's judgments towards internal control are more homogeneous for more experienced auditors.
Ashton & Brown, 1980	The study is about descriptive modeling of auditor's internal control judgements.	Experimental	31	N/A Experimental		Auditor's judgments towards internal control are more homogeneous for more experienced auditors.
Hamilton & Wright, 1982	Considering the relationship between years of experience and judgment consensus (inter-auditor agreement), the stability (reliability) of judgments, the relative weighting (importance) of, and the degree of self-insight into the relative weighting of, internal control indicators.	Experimental	78 audit firm personnel members and a large student sample	N/A Experimental		No high association is found between years of experience and the investigated aspects (except for improved self-insight).
Brown, 1983	Investigating some factors which might be considered important by independent auditors when evaluating the reliability of an internal audit function. The degree to which consistent use is made of those factors by auditors is also evaluated.	Experimental	101	N/A Experimental		Auditor's judgments towards internal control are more homogeneous for more experienced auditors.
Dunn & Gergard, 2001	Investigating differences in multiples aspects (e.g. ease of use, satisfaction) of different types of model representations (information presentation). Specifically, auditor's use of a diagrammatic representation and linguistic representation are compared.	Experimental	46	N/A Experimental		The participants of the study considered the diagrammatic representation model to be easier to use. They used it faster than the linguistic model and were also more satisfied about it. In terms of accuracy, however, no difference was found.
Kopp & O'Donnel, 2005	Examining whether organizing information about internal controls around business processes instead of control objectives leads to stronger category	Experimental	82	N/A Experimental		Organizing training materials around business-process rather than control-objective categories helps trainees to develop stronger category knowledge. Accordingly, structuring internal control

Authors	Main topic of the study	Study type	Sample size	Period	Country	Conclusion relevant for this review article
	knowledge during training and improves internal control evaluations.					evaluation tasks around a process focus rather than an objective focus helps trainees perform better.
Carnaghan, 2006	Comparing different process modeling techniques in the context of process level audit risk assessment.	Review	N/A Review Study			Diagram-based representations often seem to be desirable for decision-making tasks. However, depending on the task a combination of text and diagrams may be superior.
Brazel & Agoglia, 2007	Investigating the effects of computer assurance specialist (CAS) competence and auditor accounting information system (AIS) expertise on auditor planning judgements in a complex AIS environment. The study thus investigates if the levels of AIS expertise influence risk assessments and accordingly adopted audit processes.	Experimental	74	N/A Experimental		General audit experience has no significant effect on auditor judgements. Specific AIS expertise, however, has a significant effect on the audit procedures adopted.
Kelton, Pennington & Tuttle, 2010	Reviewing literature on information presentation formats.	Review	N/A Review Study			Information presentation formats can influence individual decision making.
Boritz, Borthick & Presslee, 2012	Comparing performance on a business process risk and control assessment task using two different types of process information representation (namely diagrammatic and textual representation).	Experimental	139	N/A Experimental		The method of representation (diagrammatic or textual representation) has no influence on accuracy. However, people receiving the textual representation were more efficient in performing their tasks. They also achieved a higher weighted-average (based on accuracy and efficiency), than people receiving a diagrammatic representation.
Murthy & Wheeler, 2018	Investigating the association between the usage of more and less customized internal control questionnaires (based on the number of irrelevant questions) on the one hand and the accuracy of internal control evaluations on the other hand. Besides, it is investigated whether or not a computerized internal control questionnaire design where each question is shown separately instead of together with other questions, influences accuracy of internal control evaluations.	Experimental	99	N/A Experimental		No difference is found in accuracy between auditors using the customized (less irrelevant questions) and non-customized (more irrelevant questions) questionnaire. Auditors who saw only one question at a time, were less accurate in making recommendations for further testing than auditors who saw more questions at a time.
Richi, Jans, Mendling & Reijers, 2019	Investigating whether the way a task is presented influences task performance. Specifically, the association between two presentation formats (texts and diagrams) and task performance is investigated.	Experimental	167	N/A Experimental		Which type of presentation format is superior also depends on the task at hand. This implies that different tasks might demand different process representations.
AUDITOR CHARACTERISTICS - General auditor characteristics						
Asare, Fitzgerald, Graham,	Synthesizing literature on auditor's evaluation of, and reporting on, internal control over financial reporting.	Review	N/A Review Study			The ICOFR evaluation and reporting process consists out of five stages: (1) planning, (2) scoping, (3) testing, (4) evaluation and (5) reporting. The outcome of each stage influences the outcome of the other stage.

Authors	Main topic of the study	Study type	Sample size	Period	Country	Conclusion relevant for this review article
Negangard & Wolfe, 2013						Each stage is influenced by performance determinants, such as (depending on the phase) auditor attributes (e.g. experience, training, and knowledge), client attributes, auditor and client interactions, task attributes and environmental attributes.
			OTHER FACTORS			
Earley, Hoffman & Joe, 2008	Examining how auditor's awareness of the severity of classifications (made by management) of internal control problems influences their assessment of ICOFR. Furthermore, it is investigated whether cognitively restructuring the ICOFR assessment task reduces management's influence on auditors' judgement.	Experimental	97	N/A Experimental		Results indicate that auditors' judgments are biased by prior knowledge of management's classification. Moreover, auditors' judgments are influenced by management's classification in those situations where auditors should have been most skeptical. Nevertheless, the influence of management's classifications can be reduced by restructuring the tasks (requiring auditors to document the impact of ICOFR problems on financial statements).
Wolfe, Mauldin & Diaz, 2009	Examining when and how management persuasion tactics reduce auditor assessment of a potential significant deficiency arising from an internal control deviation.	Experimental	106	N/A Experimental		Management conceding versus denying IT control deviations: Auditors perceive explanation adequacy higher and perceive the deficiency as less significant when managers concede instead of deny IT control deviations. Note: These results are found for IT control deviations, but not for manual control deviations. For the latter, there seems to be no difference in assessment when managers use either concession- or denial-tactics.
Bhattacharjee & Brown, 2018	Examining whether auditors identify more with an alumni-affiliated client manager than with a non-alumnus and, if so, how this perceived relationship affects their professional skepticism in response to management persuasion tactics.	Experimental	91	N/A Experimental		Without persuasion tactics: Auditors identify themselves more with with an alumni-affiliated client manager than with a non-affiliated client manager. With a persuasion tactic: When a non-affiliated client manager uses a persuasion tactic, this is effective at influencing auditor's ICOFR evaluation. When an affiliated client manager uses a persuasion tactic, however, this leads to more severe internal control evaluations.
Rice & Weber, 2012	Examining the determinants of internal control reporting decisions under SOX Section 404 by looking at restating firms.	Archival	488	2009 (misstatements periods after 2004)	USA	Increasing the probability or reporting a weakness: financial distress, auditor effort, previously reported control weakness and restatements, and recent auditor and management changes. Decreasing the probability of reporting a weakness: external capital needs, firm size, non-audit fees, and the presence of a large audit firm.
Gramling, O'Donnel & Vandervelde, 2013	Investigating the association between an unrelated material weakness and a known misstatement associated with the identified control deficiency on the one hand and the judgement of whether or not a control deficiency is a material weakness on the other hand.	Experimental	138	N/A Experimental		Known unrelated material weaknesses or misstatements influence the assessed operating effectiveness (e.g. reduced effectiveness) of an internal control and the likelihood of reporting a material weakness (e.g. a higher likelihood of reporting a material weakness).

Authors	Main topic of the study	Study type	Sample size	Period	Country	Conclusion relevant for this review article
Newton, Persellin, Wang & Wilkins, 2016	Answering three questions: (1) Does successful internal control opinion shopping appear to occur in the US market? (2) How does competition among auditors affects client's internal control opinion shopping activities? And (3) Is the timing of auditor dismissals related to opinion shopping.	Archival	11,361-11,846	2005-2011	USA	- The findings suggest that clients successfully engage in internal control opinion shopping. - Internal control opinion shopping is more likely to occur in a highly competitive audit market. - For clients that dismiss their auditors, opinion shopping activities seem to be more likely when the auditor is dismissed late in the reporting period.

Table 14 presents the articles reviewed with regards to auditors and their ICOFR evaluations. As can be retrieved from the table, many studies regarding this topic are of experimental nature. Hence, there is limited research based on archival data available.