

# **Factors that Influence the Economic Effects of Accounting Information**

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## **Abstract of the Dissertation**

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This dissertation comprises three essays that examine factors that influence the economic effects of accounting information. The first essay studies auditor reliance on continuous auditing tools by providing a reliance framework and including two case studies from multinational firms. Businesses continuously enhance their processes via their systems to achieve targets more efficiently and effectively. Investments in business IT systems, such as ERP and data analytics, facilitate the production of real-time financial information and sophisticated internal controls to monitor them. By contrast, the external auditing processes have not witnessed a similar development (AICPA 2012). Even though there are no auditing standards that preclude leveraging automated audit tools, the approaches and techniques used in current external audits are considered relatively outdated (AICPA 2012; Alles 2015; Manson, McCartney, and Sherer 1997). The cases and discussion highlight the probable barriers to realizing the full potential of technology in an audit environment and propose ways to move the profession forward.

The second essay is concerned with corruption and anti-corruption measures. Corruption negatively effects political, economic, social, and environmental aspects of society (Transparency International 2008). To counter corruption, various researchers and non-governmental organizations (NGOs) propose measures like transparency, accountability, and integrity. Nonetheless, the literature is not clear on the effect of these measures on corruption and the relationships among them. This study attempts to address this gap empirically by analyzing a unique dataset from Kuwait, a resource-rich developing country, via structural equation modelling. The results show that although transparency is an important factor in mitigating corruption, it does not directly affect it. Rather, transparency has a strong and significant effect on accountability, and accountability affects integrity, which ultimately explains corruption. This result shows that transparency initiatives should not be an end in themselves, but rather part of an effort that includes a push for accountability measures and a culture of integrity in the workplace.

The third essay studies the determinants of internal control weaknesses in information technology, software, security, and access. Enterprise resource planning (ERP) systems have proved to be essential for the operation of modern firms. Not only do ERPs improve the operation of firms, but they also significantly improve their internal controls as well (Morris 2011). Nonetheless, internal control weaknesses vary in kind and severity and ERPs do not mitigate them all. Internal control weaknesses related to information technology, software, security, and access (hereafter, ICW-IT) are an example of weaknesses that ERPs may not

effectively mitigate. Previous papers have studied the effect of ERP systems on internal controls and find that there is no significant difference in ICW-IT among ERP and non-ERP adopters. Due to the importance of ICW-IT and the significance of ERP systems, this paper investigates the determinants of ICW-IT within ERP firms. The results of the study show that firms with ICW-IT are more complex, have smaller audit firms, have more organizational changes, and are smaller in size.

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# **Chapter 1**

## **Introduction**

Financial accounting information plays a significant role in any economy. Financial accounting information affects investments, productivity, and value-added of firms (Bushman and Smith 2001). Bushman and Smith (2001) discuss three channels through which financial accounting information may affect economic performance directly and indirectly: (1) project identification, (2) governance, and (3) adverse selection. The first channel, project identification, involves the use of financial information by managers and investors to identify opportunities and invest in good projects via financial capital, increasing the productivity of assets in place, or allocating the appropriate human capital. Financial information can support managers' and investors' decisions directly via reported profit margins or indirectly through the effect of financial information on stock price (Kothari 2001) or by encouraging analyst following (Chang, Khanna, and Palepu 2000; Dechow, Sloan, and Sweeney 1996). Thus, providing reliable information to investors and managers directs human and financial resources towards good investments and ultimately enhance the efficiency of the economy.

The second channel, governance, involves the use of financial information as a control mechanism to discipline managers on project selection and expropriation. Accounting information is directly incorporated into internal controls to encourage the use of corporate resources for good projects and prevent the expropriation of investors' wealth.

The final channel, limiting adverse selection, involves the use of financial information to reduce asymmetries among investors and liquidity risk. The timely disclosure of financial accounting information levels the information playing field among investors, which ultimately attracts more funds in the market and lowers investors' liquidity risk (Baiman and Verrecchia 1996; Diamond and Verrecchia 1991; Leuz and Verrecchia 2000; Verrecchia 2001). Thus, as Bushman and Smith (2001) argue, high-quality accounting regimes are expected to support economic growth.

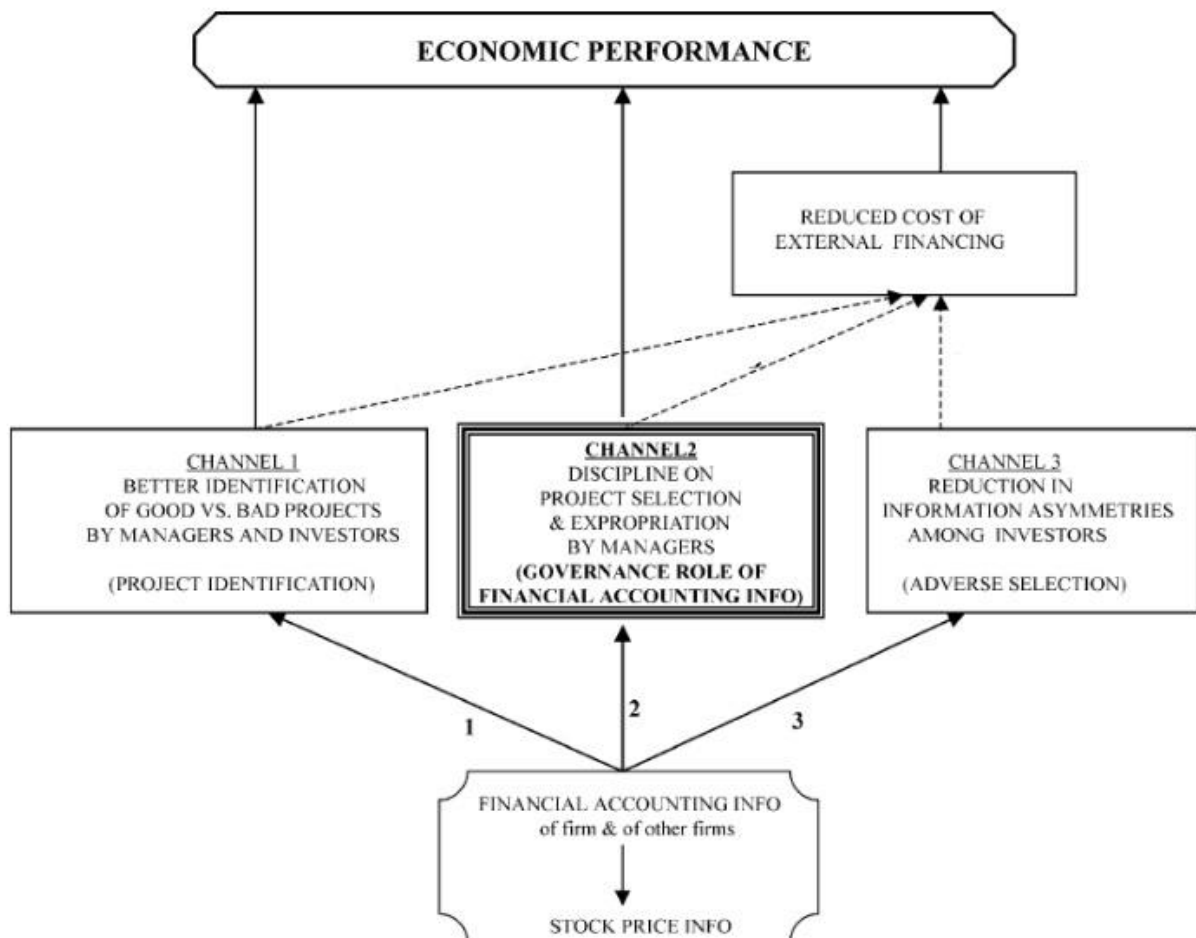


Figure 1. The channels through which financial accounting information affects economic performance (Bushman and Smith, 2001)

The effects of financial accounting information through the channels shown in Figure 1 vary with many factors. For example, Bushman and Smith (2001) argue that powerful interactions between the financial accounting regime and other institutional characteristics are likely to influence the economic effects of financial accounting information. This dissertation explores three factors that may impact the effect of financial accounting information on firms' economic performance.

## **1. Auditing Regime**

The auditing regime may influence the effects of financial accounting information through all the three channels. For example, higher quality audits provide more relevant and reliable information for investors and managers in their decision-making processes, increase the effectiveness of accounting information in disciplining managers, and reduce adverse selection in markets (Bushman and Smith 2001).

"It is expected that the economic benefits of financial accounting disclosures to increase with the rigor which with the reported accounting numbers are audited. Accounting numbers that are audited rigorously are likely to be less distorted by managerial reporting biases and errors. Hence, we expect rigorously audited accounting data to provide better information for identifying good and bad investments, disciplining managers, and reducing adverse selection among investors." (Bushman and Smith 2001, p. 307).

The first essay explores the impact of automation and analytics in internal controls on external audit processes. Specifically, the essay presents an overview of the traditional external audit process, the technological tools that are introduced



in internal controls, and the reliance on these tools by external auditors. Companies are overhauling their business processes by incorporating IT systems like Enterprise Resource Planning systems (ERPs) to deal with the influx of endogenous and exogenous information. These developments enable similar advances in accounting information systems and result in the generation of real-time financial information (Chan and Vasarhelyi 2011), which increases the demand for continuous risk evaluation and resolving weaknesses in controls instantaneously (Teeter 2014). Various robust continuous auditing (CA) platforms and tools have also been developed such as ACL and Oversight, which are largely purchased by internal auditors. Nonetheless, external audit processes have not yet benefitted from such developments. External auditors persistently lag behind their clients in utilizing such advances, and their approaches and techniques are considered outdated (AICPA 2012; Manson, McCartney, and Sherer 1997). The reluctance to rely on advanced tools may be attributed to first-order and second-order factors. First-order factors are related to the audit firm itself, the task it must accomplish, or the tool that it chooses. By contrast, factors that are categorized as second-order relate to auditees and regulators.

## **2. Political Influence**

Political influence is another factor that influences the effects of financial accounting information. The efficiency effects of accounting information of a given quality would diminish as the ability and propensity of politicians to expropriate wealth increases (Bushman and Smith 2001). A study by Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002) finds that higher costs of entry to a certain

market is associated with weaker political rights, fewer constraints on the power of top government officials, and more corruption.

The second essay concerns corruption and anti-corruption factors. Specifically, the essay studies the effect of three significant anti-corruption measures (transparency, accountability, and integrity) that were proposed by Robert Klitgaard (1998) and the United Nations Development Programme (UNDP 2004) on corruption. The relationship among the three deterrents of corruption is studied using a unique data set that was provided by Transparency International – Kuwait. The results of the study illustrate that not all deterrents have the same effect on corruption. For example, transparency does not have a significant direct effect on corruption, rather it affects corruption through accountability and integrity. Moreover, further analysis shows that a strong and significant relationship exists among the three deterrents, which complements the first finding by suggesting that transparency can encourage accountability and integrity, and ultimately reduce corruption if it is implemented correctly.

### **3. Control Mechanisms**

Bushman and Smith (2001) argue that effective control mechanisms in an organization are expected to increase the economic benefits of financial accounting information. They believe that a positive interaction between the quality of the financial accounting regime and the quality of control mechanisms create additional support for the governance effects of financial accounting information.

The third essay is concerned the effect of Enterprise Resource Planning (ERP) systems on internal control weaknesses. ERP systems have been widely

adopted (Debreceeny et al. 2005; Chang et al. 2014) to replace many standalone application systems that were previously responsible for companies' core business processes. Besides improving the operation of companies, the integrated structure of ERPs is expected to maintain accurate and reliable data within the system through the adoption of suitable controls. These controls play an important role in building investors' confidence and ensuring low cost of capital by increasing the transparency of the company (Ashbaugh-Skaife 2009; Chang et al. 2014). Nonetheless, increased ERP adoption introduces new IT risks that demand increased information system security and internal controls related to information systems (Dhillon 2007; Morris 2011; Stoel and Muhanna 2011; Walters 2007). This demand is met by software vendors in the form of built-in controls within their ERP systems (Chang et al. 2014; Morris 2011) and by internal auditors in the form of internal control frameworks that constantly enable the audit of the effectiveness of the system's internal controls. Even though these developments in controls are having a positive impact on the effectiveness of internal controls, and ERP-adopters have reported relatively fewer internal control weaknesses (Morris 2011), not all types of internal control weaknesses have been mitigated. Significant internal control weaknesses related to information technology, software, security, and access controls (ICW-IT) have not improve with the implementation of ERP systems (Morris 2011). This essay studies the determinants of an important internal control weakness by analyzing the relationship between the occurrence of a specific ICW-IT and various determinants of internal control weaknesses in firms that implement ERP systems.

## **Motivation and Contribution**

Many factors affect the efficiency and effectivity of accounting information either directly or indirectly. It is essential to consider how various aspects of an organization's operation affect the production of financial information. This dissertation highlights some of these factors and discusses their probable effect on financial information. Presenting these issues and putting them into perspective may encourage further research on various developments in accounting and their effect on financial information.

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## **Chapter 2**

# **Auditors' Non-Reliance on Continuous Auditing Tools: Two Case Studies from Multinational Firms**

### **1. Introduction**

Auditing approaches and techniques that were once useful are now considered outdated (AICPA 2012). External auditors persistently lag behind their clients in adopting technological advances such as client-server computing and the Internet (AICPA 2012; Manson et al. 1997). Given the relative advantages of leveraging the available CA tools on the level of control precision and the cost of assurance compared to traditional sample-based testing (Davidson et al. 2013), external auditors need to develop ways to use them in the current technology-driven environment.

This essay utilizes the concept of reliance to study the use of CA tools in audit engagements. Discussion of reliance on CA is mostly ignored in the auditing literature, although the concept of reliance has been raised with respect to other auditing tools. For example, Bierstaker et al. (2014) apply the unified theory of acceptance and use of technology to identify and examine factors that influence auditors' use of computer-assisted audit techniques. Boatsman et al. (1997) use an experiment to examine auditors' reliance on decision aids in audit planning. Hampton (2005) studies the determinants of reliance on intelligent decision aids



via an empirical test of the theory of technology dominance. Malaescu and Sutton (2015) also conduct an experiment with experienced external auditors to evaluate their reliance on internal audit's use of CA<sup>1</sup>.

A review of the auditors' reliance literature results in a comprehensive reliance framework. The reliance framework presented in this essay is comprised of first-order and second-order factors. First-order factors are mostly under the control of the external auditors and relate to the audit firm, CA tool, and the task at hand. Audit firm factors relate to the environment, such as risks, pressure, and facilitating conditions. The tool and task affect the reliance of external auditors through the technical features of the tool and task complexity respectively.

Second-order factors are generally out of the external auditors' control, and are related to auditees and regulators. Auditees affect the reliance of external auditors' use of CA tools through their demand for the use of these tools and the quality of their internal audits. Regulators affect external auditors' reliance on the use of CA tools through the standards and guidance they provide.

Siggelkow (2007) argues that arguments made in purely conceptual studies have two main limitations. First, readers of such arguments are often unaware how the proposed constructs are reflected in real life. Second, the underlying mechanisms of conceptual arguments are often speculative. Case studies are

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<sup>1</sup> To my knowledge, Malaescu and Sutton (2015) and Davidson et al. (2013) are the only studies that discuss reliance with respect to CA. Both are experiments.

capable of mitigating both of these concerns by offering concrete examples of the constructs employed and how they operate. For example, the only two papers (to my knowledge) that discussed reliance on CA (Davidson et al. 2013; Malaescu and Sutton 2015) were conducted in an experimental setting. Presenting cases that document detailed accounts of events that unfold in audit engagements provides a more nuanced understanding of the reliance decision in a CA environment.

This essay presents a unique opportunity to discuss two case studies that were sourced from a risk officer who was involved in both engagements. These case studies illustrate the current technological lag in the audit profession and highlight the effect of some of the reliance factors proposed in the reliance framework. The first case involves a financial services arm of a large multinational company that owns a CA system that monitors controls related to operations and compliance. Even though the company's Big-4 auditing firm had total access to the tool that monitors the entire population of transactions, they resorted to asking for random samples of controls that were monitored by the system.

The second case involves a large multinational IT service provider and its Big-4 external audit provider delivering a Third-Party Assurance (TPA) Statement on Standards for Attestation Engagements No. 16 (SSAE-16). The service provider had three consecutive years of "qualified" SSAE-16 reports with deficiencies in the areas of missed security updates, patching, and network-level version upgrades on servers in some of its large data centers. This prompted the service provider to develop a set of CA tools to monitor all of its servers and to

share the tools and results with the external auditor. Nonetheless, the external auditors were unwilling to leverage the system and reverted to taking samples. It is worth noting that the random sample of servers chosen did not include any of the deficient servers from prior years. The auditor's reluctance to rely on evidence from available technology in the audit resulted in an "unqualified" audit opinion, which does not reflect a fair assessment of the current environment.

These cases emphasize how external auditors rely on outdated procedures when conducting their audits. Such procedures, whether formal or not, promote periodic sampling techniques even though population-based continuous monitoring of controls exist through the use of accredited continuous auditing tools. These cases show how capable audit technology is often not relied upon and efficiently integrated into the audit process. Rather, new tools are added to existing ineffective manual processes, thus creating more work without a significant increase in assurance or control precision.

The reliance factors discussed in this essay aid in understanding the various barriers that preclude auditors from relying on CA. For example, the risks and pressure that were present after the three qualified opinions in previous years in the second case negatively affected external auditors' reliance on CA tools. The absence of guidelines that facilitate the use of CA tools in the first case also clearly failed to encourage reliance on the available tools. Furthermore, the relative sophistication needed to deal with IT-related tasks in the second case and the standardized technical features of the tools in both cases may have negatively affected external auditors' reliance on these CA tools.

The contribution of this essay to the auditing literature is twofold. First, the case studies provide unique documentation of audit engagements with regard to the external auditors' interaction with the internal auditors' advanced tools. This provides researchers with a rare opportunity to understand and witness how auditors conduct their engagements with clients that possess advanced internal control technologies and may encourage additional streams of research in audit and CA. Second, even though the results of the cases are not generalizable, they do support the idea that the comprehensive reliance framework provided in this paper is plausible and justifiable. By exploring the interaction between external auditors and audit technologies like CA in a real-life setting, this paper aims to spark a dialogue that may eventually move the profession forward towards more reliance on superior audit technologies. The next section presents the background of CA. The third section presents the two case studies, which is followed by the reliance framework and finally a discussion.

## **2. Background**

### *2.1 Technological Advances*

The auditing community must deal with the advancement of information technologies. Businesses are transforming rapidly due to the amount of data that drives marketing and strategic decisions and the amount of data that is generated from processes and transactions.

Most large businesses have adopted enterprise resource planning (ERP) systems. These systems are revolutionizing the operation of organizations and, concurrently, they are introducing some new challenges, such as monitoring and

auditing the now electronized business processes. These challenges demand advances in accounting information systems to provide real-time financial information (Chan and Vasarhelyi 2011), which also aligns with the investment community's demand for more near "real-time" reporting.

The adoption of technologies such as ERPs and analytics have paved the way for monitoring systems that allow continuous control of key business processes (Vasarhelyi et al., 2010). Unfortunately, the audit profession has not experienced an equivalent evolution. Assurance services have lagged in updating basic audit procedures to complement advancements in technology (Chan and Vasarhelyi 2011; Zhang, Pawlicki, McQuilken, and Titera 2012). This reality puts financial audits at risk of becoming less relevant to stakeholders' needs (Zhang et al. 2012).

#### *2.1.1 Continuous Auditing*

"Innovation of the traditional audit process using an automation technology such as continuous auditing (CA) will be an essential step toward the development of real-time assurance" (Chan and Vasarhelyi 2011, p.153). CA is defined as "a methodology for issuing audit reports simultaneously with, or a short period of time after, the occurrence of the relevant events" (CICA 1999). The concept of CA was first introduced by Groomer and Murthy (1989) and Vasarhelyi and Halper (1991). Since then, the academic community and software developers have introduced several innovations to the traditional practice of auditing. Although most implementations of CA have been in an internal audit setting, the benefits of CA over traditional auditing may be also extended to external audits.

Chan and Vasarhelyi (2011) discuss innovations that were introduced by CA along seven dimensions: (1) Frequency of audits; (2) Approach; (3) Procedures; (4) Role of auditors; (5) Nature, timing, and Extent; (6) Testing; and (7) Reporting. To put these innovations in perspective, they are incorporated into the traditional audit process in Figure 2. The innovations mostly transform the procedures phase of the audit. Specifically, they directly affect the nature, timing, and extent of procedures. Under CA, the nature of procedures used is mostly automated and based on data modeling and data analytics instead of humans performing manual testing. Furthermore, the timing of CA procedures is generally simultaneous. Continuous tests of controls and transactions via continuous controls monitoring (CCM) and continuous data assurance (CDA) results in an audit approach that is proactive rather than reactive as in a traditional setting. Moreover, the extent of procedures under CA relates to the testing of the whole population of interest unlike the sampling used in a traditional setting. These innovations in audit procedures will fundamentally change the audit process in two main aspects. First, the objectives of auditors will shift from performing labor-intensive and time-intensive procedures to handling exceptions and focusing on procedures that require human judgment, which may shift the auditors' role to that of an independent certifier or insurer of CA systems (Chan and Vasarhelyi 2011; Elliott 2002). Second, the output of the now enhanced procedures will shift from the traditional "end of period reports" to more frequent reports.

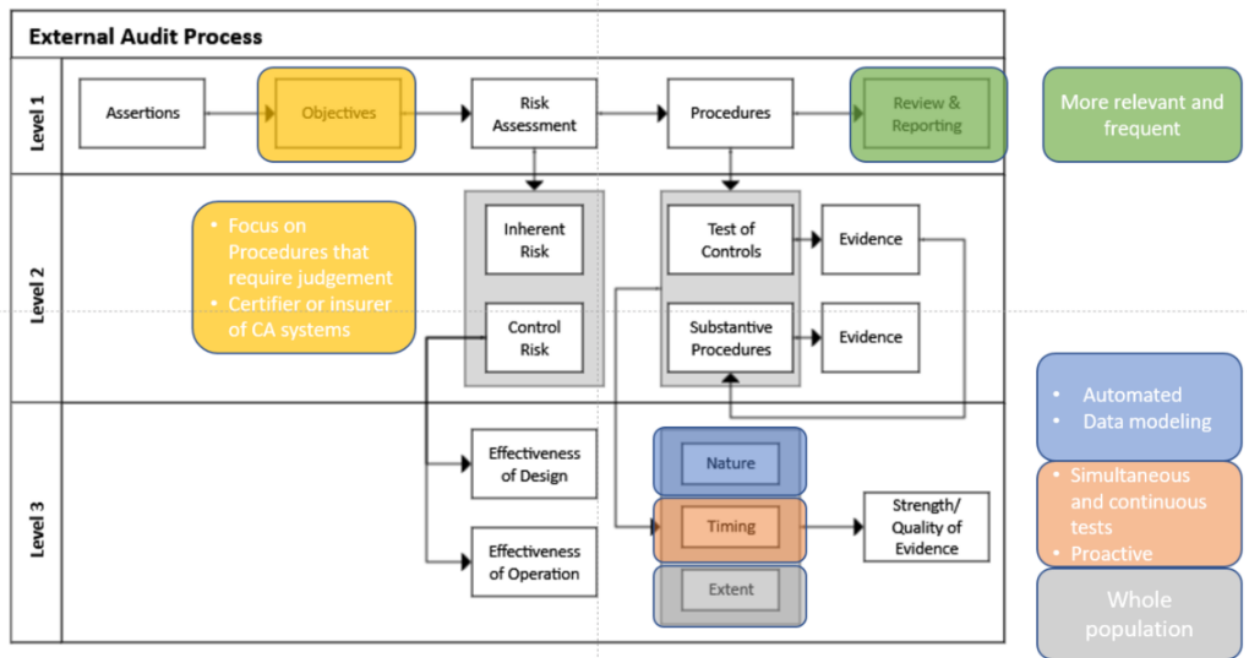


Figure 2. CA incorporated into the traditional external Audit Process

The advantages of utilizing CA systems in external audits are best illustrated in the experiment conducted by Davidson, Desai, and Gerard (2013). They show the relative advantage of CA systems over traditional periodic auditing by examining the external auditors' willingness to rely on them in their audits, which is the ultimate test given the amount of risk an auditor is exposed to. Confirming prior studies (e.g., Desai, Gerard, and Tripathy 2011; Glover, Prawitt, and Wood 2008), they find that in a traditional periodic setting, external auditors rely on the internal audit function significantly more and allocate significantly less audit effort if the internal audit function is outsourced, due to the potential incentives and biases associated with in-house internal audits. However, the results of Davidson et al. (2013) show that the use of CA in the in-house internal audit function moderates that disparity between in-house and outsourced functions. Specifically,

external auditors' reliance and effort are the same for in-house and outsourced internal audit functions and is significantly greater than when an in-house internal audit function conducts traditional periodic audits.

### **3. Case Studies**

This section presents two case studies from large multinational companies. The cases offer a unique opportunity to gain a better understanding of undisclosed key aspects of audit engagements. Specifically, the cases document the external auditors' interactions with the internal auditors concerning the CA system installed by the companies. The details for both cases were obtained through extensive discussions with an internal controls risk officer, who was present during both engagements.

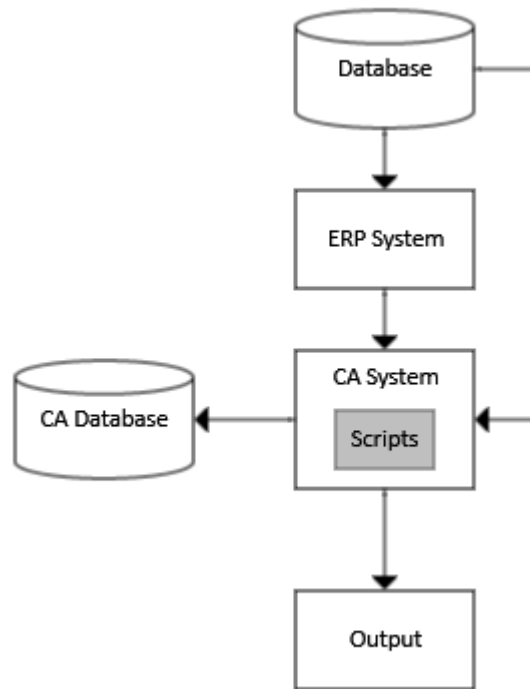
#### *3.1 Case 1: Financial Services Audit in a Large Multinational Company*

The first case involves a large multinational company that has an extensive financial services operation that supports energy, construction, and healthcare sales, as well as financing for municipalities and the company's internal operations. Due to active collaboration with other companies, regulators (i.e. AICPA, IIA), large public accounting firms, and assurance software firms via leading academic research groups like the Continuous Auditing and Reporting Lab at Rutgers University (CAR Lab), the firm was able to leverage audit and assurance technology across most of its corporate functions and divisions. The firm extensively leverages analytics, such as evaluation of reconciliations, workflow analytics, electronic workflow validations, and operational lease reviews, to ensure data integrity and security, which in turn allow its clients to make investment



decisions with reliable information. The firm's financial services division in the US, while seen as an innovator in financial services analytics, is still working on supporting the adoption of this innovative technology in the company's other financial services around the world.

The firm's financial services continuous monitoring system is one such example where this large division leveraged ACL to monitor more than 250 controls related to operations and compliance continuously to ensure that the firm's policies, procedures, and business processes are effective. The system, which was developed in-house and is owned by the internal audit department, assures that all transactions are monitored and all controls are in place throughout the year. The CA system has complete access to the company's ERP systems to monitor transaction data and system parameters and activity logs. A depiction of the CA system is illustrated in Figure 3, which is based on discussions with the risk and internal controls officer at the company.



*Figure 3. The CA system at the financial firm*

The developed scripts within the CA system represent the controls over operations and compliance (e.g. 3-way match), which are aligned with internal and external auditors' objectives. The scripts analyze the data gathered from the database and ERP system and stores anomalies in the CA database for further investigation. Based on the anomalies detected and the settings chosen, the CA system produces reports for relevant parties, such as the owners of transactions, auditors, and management.

The automated system was carefully designed by the internal audit department with full cooperation and support from senior management, operations, and IT. The CA system was fully tested by both the internal audit staff and the external auditors for all key IT General Controls (ITGC) and IT application controls (ITAC). As their name suggests, ITGC are usually controls that apply to all systems, such as controls over IT governance, IT infrastructure, security and access to operating systems and databases, application acquisition and development, and program change procedures (Hall 2010). By contrast, ITAC are controls that are application-specific, and their objectives are to ensure the validity, completeness, and accuracy of financial transactions (Hall 2010). Figure 4 is an illustrated example of ITGC and ITAC from Hall (2010). An example of ITGC is “Change Management,” which requires at least two approvals before implementing any change in an application, whether by a developer or a user in the productive system. System accreditation helps assure that control analytics and monitoring frequency cannot be compromised. This control allows auditors and company management to rely on the assurance provided by the control monitoring processes and the ACL application.

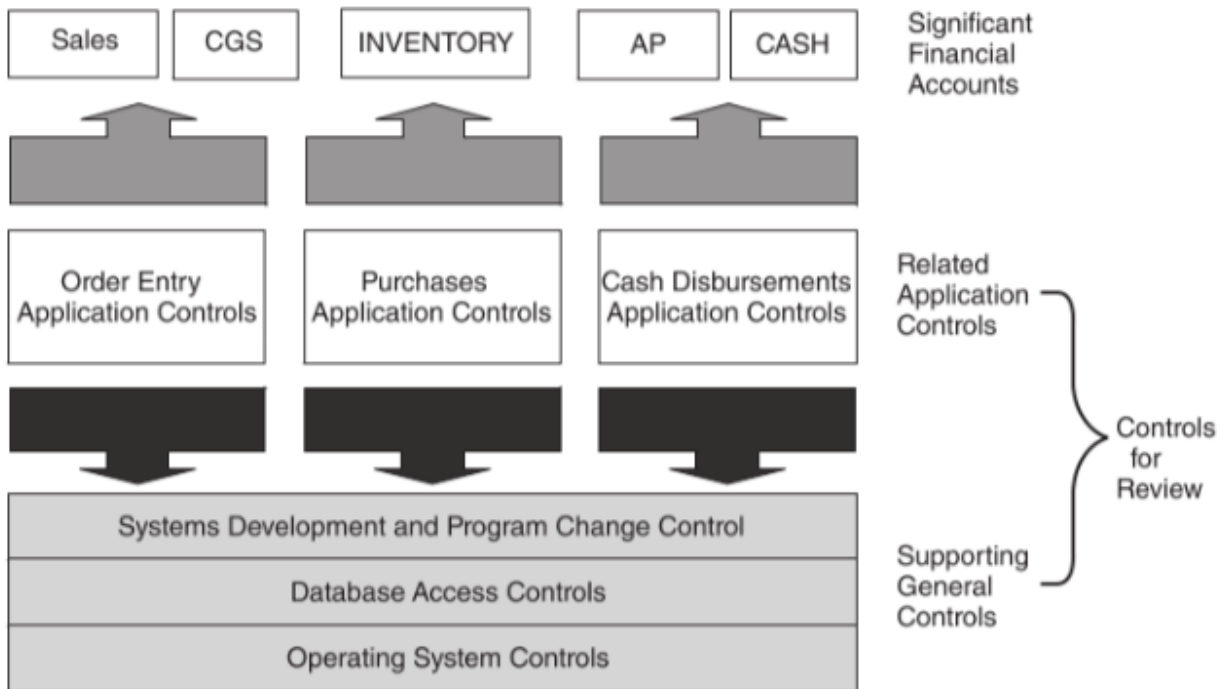


Figure 4. IT General controls and application controls (Hall, 2010)

The Financial Services Continuous Monitoring system includes “Closed Loop Escalated Alerting,” a feature that assures that whenever a control anomaly is identified, the control owner is electronically alerted via an automated workflow. The owner is then required to document the full remediation of the deficiency within a specific period and the tool monitors whether the documented remediation is, in fact, completed. If the control remediation is not completed in a pre-specified period, the deficiency escalates to the control owner’s supervisor and eventually to the CFO of the company. This aspect of CA assures that the identification of a control anomaly is generally addressed within a specified timeframe and offers an exponential increase in control precision due to the monitoring of the entire population on a continuous basis. Thus, the control process becomes the control test, rather than testing the actual transactions. Since the “Closed Loop Escalated

Alerting” process assures and documents that remediation is completed before the anomaly has an impact on the business or process, it effectively transforms detective controls to preventive controls. For example, any anomalies found in the financial services controls monitored by these systems would always be fully remediated before any postings to the GL, resulting in no information value loss for the company. Relying on this type of monitoring improves not only controls and assurance, but also reduces human and system errors and helps detect and prevent fraud. The graph in Figure 5 was provided by the company’s risk and internal controls officer. The graph shows the impact of automated analytics on the exception rate of the monitored controls over a 4-year period. The analytics covering the population of input checks, validity checks, and compliance with internal and external financial services regulations show a consistent reduction in the average exception rate over time.

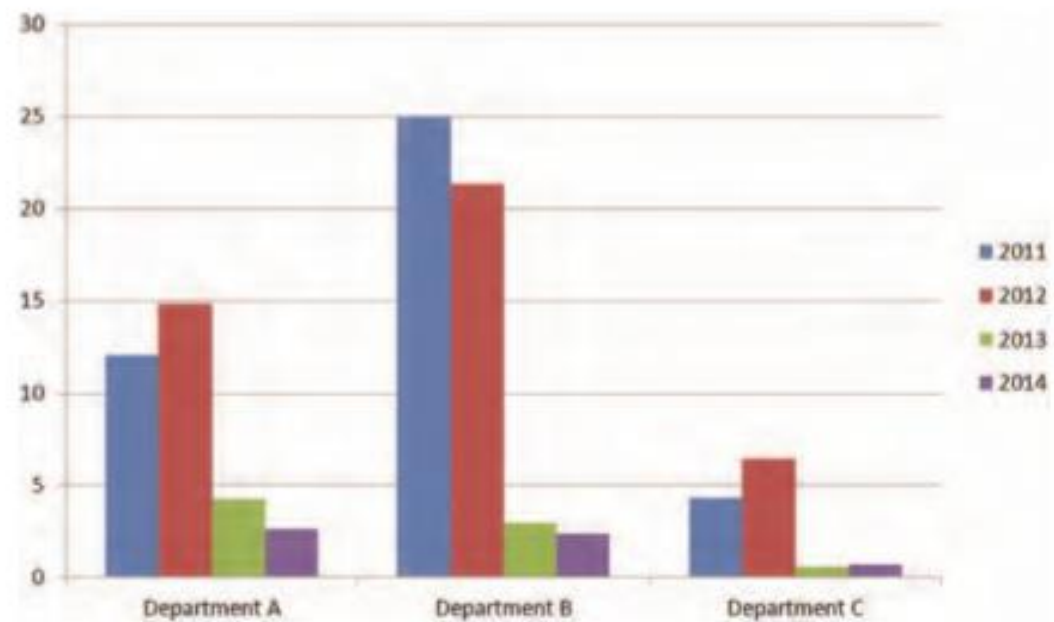


Figure 5. Change in departmental exception rates (2011-2014)

When the external auditors from a top tier audit firm arrived with their year-end financial audit plan to review the processes and controls covered by this advanced CA system, they first verified the ACL tool for the firm's ITGCs and ITACs. To verify the accreditation, the ACL CA system was evaluated for the year-end financial audit as any other "in scope" financially relevant system, as required by the 2002 Sarbanes-Oxley Act.

It is also worth noting that the external auditors had some input in designing the monitoring tool and had total access to the system, its database, and the generated reports (i.e. output). Their input was in the form of requests to add certain financial reporting controls to the automated ACL tool. Consequently, the

requested addition provide the external auditors with a way to improve their own audit efficiency with this client.

The engagement team auditors clearly value the improved level of assurance and efficiency of automated controls as an aid in their audits and attestations. The engagement team also communicated their desire to leverage automation to become more efficient and effective in providing assurance to their other clients, but the guiding standards and their own legacy audit practice guidelines are often not updated to support the use of automated analytics.

In the testing phase of the audit, the external auditors asked for random samples (often non-statistical) of controls that were monitored by the ACL system. Since the ACL system had already monitored the entire population of transactions for the entire year and produced detailed reports that documented the findings and remediation, the VP of Controls Management argued that taking samples to test continuous controls added no additional value to the control process and only added to the work and cost of compliance for both the external auditors and the company. Periodic sample-based control testing appears to be an antiquated and inadequate audit method for monitoring modern business processes, especially for firms that have high transaction volume, large data populations and the ability to do population tests.

Periodic sampling, as defined in audit programs and guidelines of both internal and external auditors, seldom selects more than 30 samples in populations that may have hundreds of thousands of records. If statistical sampling methods with appropriate confidence levels were used to audit large populations of data in

modern financial reporting systems, the sample sizes that would need to be pulled and evaluated to assure a statistically sound sample would be so large and prohibitive that no audit firm or client could afford to have a traditional manual audit performed. For example, if an auditor wanted to use a statistically sound sampling method and was looking at an accounts payable or other sub-ledger dataset with just 100,000 records and wanted to have a 95% confidence level with a confidence interval of 1, the auditor would need to pull and evaluate a sample of 8,763 records.

Although it seemed unreasonable to take a sample when documented testing of the entire population has already been completed by the ACL automated monitoring system, the external auditors were compelled to sample because their procedure protocols require a documented periodic sample-based approach. After reviewing audit standards and guidelines from organizations like the Institute of internal auditors (IIA) and the Public Company Accounting Oversight Board (PCAOB), it is apparent that none of the standards preclude reliance on automated analytics, although they do not encourage the use of automated analytics either. Ultimately, the requirement for periodic sampling is only defined in the audit firm's own audit program and guidelines, which provide very granular "check the box" type of guidance to assure that even the most junior auditor can execute an audit for any client in any organization.

When the VP of Controls Management asked the external auditors why they had to document sampling in addition to the comprehensive population-based continuous monitoring process described above, the senior external audit partner



indicated that he feared the audit could be disallowed by the PCAOB and he would be reprimanded by his superiors if he did not do sampling.

The external auditors' guidelines are what the PCAOB, as the auditor of audit firms, will use in evaluating how an audit firm is performing on behalf of its clients. Like most auditors, the PCAOB holds firms accountable for doing whatever is stated in their own guidelines.

After a long deliberation at the year-end, the following compromise was reached between the external auditors and the internal financial services team.

1. A process walk-through and, if appropriate, process mining would be done once per year by the client's internal audit group and reviewed by the external auditors to assure that there was no material process change and that the automated control design is still effective. Process mining using activity logs can be an effective and automated way to validate that a process is being followed and that the key control is appropriately designed to mitigate risk to the financial statements integrity.
2. The company would show and the external auditor would validate that all ITGCs and ITACs are effective for the ACL system. Analytics are used where appropriate for validation.
3. The company would demonstrate via electronic reports already produced by the ACL tool that the automated monitoring system was working during the exposure time of the audit (i.e. the current year). This is important to assure that the continuous monitoring system exists and that no one could disable or change the settings of the ACL tool. This is covered by the "change management" part of the ITGCs.
4. Documentation would be provided for any approved "management overrides" on controls or analytics. As with any manual or automated controls, there will be approved exceptions to control requirements, which need to be appropriately approved and documented.

These agreed-upon requirements solicit very little effort on the part of both internal and external auditors, and the resulting level of control precision and fraud prevention from the fully automated, continuous, population-based auditing tool provides better results than any periodic sampling-based method an auditor might

employ. Interestingly, the external auditors returned the following year with the same sample request, which shows that their audit plans and guidance remained the same and were not updated with the agreed upon compromise.

### *3.2 Case 2: Third Party Assurance “SSAE-16” Audit in a Large Multinational Firm*

The second case study involves a large multinational IT service provider and its Big-4 external audit provider delivering a Third-Party Assurance (TPA) Statement on Standards for Attestation Engagements (SSAE) No. 16. The SSAE-16 for reporting on Service Organization Controls (SOC-1), was finalized by the AICPA Auditing Standards Board in January 2010 with an effective date of June 15, 2011. The new SSAE-16 standard effectively replaced the former standard for Reporting on Controls at a Service Organization (SAS 70) as the authoritative guidance for reporting on service organizations. The “SOC-1” SSAE-16 is an auditing standard for service organizations focused on Internal Control over Financial Reporting (ICFR) and the Type II version evaluates and tests the design and operating effectiveness of controls for a specified period (typically 6 months), via testing of financial related ITGCs.<sup>2</sup>

SSAE-16 audits can only be performed by an appropriately independent CPA firm and are secured by a qualified service provider as a kind of “good

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<sup>2</sup> See <http://www.cpa2biz.com> to view a copy of SSAE 16 from the AICPA, publication number 023035

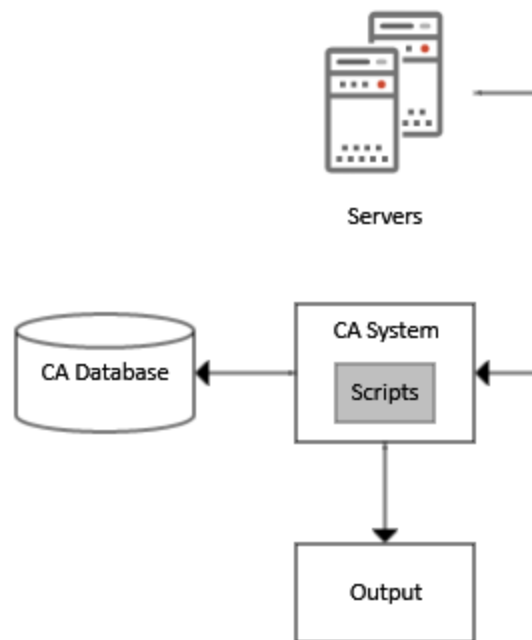
housekeeping seal” to show that appropriate ITGCs are in place. A TPA report provides a formally signed attestation on the proper design and effectiveness of the service-related controls that may affect the auditee’s customers. This report can be shared with the service provider’s customers and their respective auditors, which provides a reasonable level of assurance that the controls of this 3<sup>rd</sup> party service provider are in place, designed properly, and operating effectively. An SSAE-16 can range in cost from \$30,000 for a small or medium-sized service provider to several hundred thousand dollars for a large multinational company, and the reports generally must be re-performed each year.

In this specific case, the large IT service provider had three consecutive years of “qualified” SSAE-16 reports for failures identified via non-statistical sampling at several large data centers across the USA. The deficiencies identified were different each year, but were mostly in the areas of missed security updates, patching, and network-level version upgrades on servers in some of their large data centers around the USA. Most of the issues occurred in two large data centers that have a total of over 7,000 servers that provide data management services to many companies around the world. While the company diligently tried to keep up with required server updates, it is no small task to identify, review, and implement all required server upgrades and security patches consistently in a timely manner, especially with the advent of heightened cybersecurity issues for cloud and third-party IT providers.

The recurring failure to pass the SSAE-16 audits put both the service provider and all its customers at risk for cyber-crimes, financial fraud, and related

reputational risks. If these failures persist over multiple years, there is a risk that an external auditor may see the failures as a “systemic problem” that might result in a significant deficiency or even a material weakness in the company’s financial reporting. The effect of such an outcome may, at the very best, require performing additional substantive audit procedures on the service provider and all of its customers that rely on the SSAE-16 report, which may be costly and burdensome. In a worst-case scenario, such an outcome may deem the financial statements of the service provider unreliable, a disastrous outcome for any publicly traded company.

The service provider recognized that using manual identification and remediation methods to identify and update emerging security upgrades, vendor patch updates, and technical fixes on more than 7,000 servers in a timely manner is difficult. To automate this task, they developed and purchased a set of CA tools with analytics that monitors all 7,000+ servers continuously and automatically installs updates and patches for all servers in all data centers as required. With the new tools in place, the service provider quickly managed to identify and remediate many deficiencies that the former periodic sample-based system failed to identify. Figure 6 illustrates the CA system as described by the risk and internal controls officer at the company.



*Figure 6. The CA system at the service firm*

The service provider used these new tools to document the remediation of all prior year deficiencies and shared the tools and results with their external auditors with the expectation that they would rely on these tools going forward. Through its internal audit department, the service provider assured the accreditation of these new CA tools for all key ITGCs and the external auditors confirmed the accreditation. This helped ensure that other controls that rely on the ITGCs, such as IT application controls, analytics, and monitoring frequency, could be less easily compromised and that the auditors and the company could rely on the assurance from the continuous server-monitoring process.

When the independent external auditors from one of the top tier audit firms arrived with their annual SSAE-16 Type II audit plan, they were unwilling to

leverage the fully accredited tools that were already in place and were previously shared with them. Due to their existing SSAE-16 internal practice and guidance, the external auditors reverted to taking samples of 25-30 servers from a population of over 7,000 servers in a complex multi-data center environment to provide assurance on security, access, and patch updates.

The service provider had capable tools that had been accredited by the internal and external auditors at its disposal, which if used and relied upon by the external auditors, could have precluded any sampling for all covered controls, while providing a significantly higher level of control precision at a much lower cost. Interestingly, the partners of the audit firm warned the service provider and some of its data center customers that delays in completing the remediation of prior year's SSAE-16 deficiencies might result in a fourth qualified report if any of the prior deficiencies reoccurred in the current sample. As anticipated, with a small manual random sample of 25-30 servers from a population of thousands, none of the known deficient servers from prior year's sample showed up in the current year. It is worth noting that if the population-based continuous monitoring tools were relied upon, the auditors would have identified the un-remediated servers, and the outcome of the audit might have been different.

Although the large audit firm was conforming to current standards and their own internal guidance for performing the SSAE-16 audits, their reluctance to rely on evidence from available accredited technology in their audit resulted in an "unqualified" audit opinion, which does not reflect a fair assessment of the current

environment. Moreover, the auditors could have reached a different conclusion had they leveraged existing automated tools.

#### **4. Reliance**

These two cases highlight the external auditors' reluctance to rely on the CA systems that were made available by their clients. Boatsman, Moeckel, and Pei (1997) describe reliance on auditing tools as intentional or strategic in nature and usually attributed to concerns about consequences more than technical features. Even though the reliance variable is traditionally equated to user's agreement with recommendations, recent studies stated that equating reliance to the degree to which users incorporate the recommendations into their judgments is a better description (Hampton 2005). This section aims to explore some of the likely factors that affect auditors' strategic decision to rely on CA systems in the external audit profession.

After reviewing the various factors that affect the reliance decision in the literature, the factors were categorized into first-order and second-order factors. The first-order factors are generally under the external auditors' control, including factors that are related to the audit firm itself, the tasks that the auditors must accomplish, or the tool that they might use. The second-order factors that external auditors cannot control are related to auditees or regulators.

### *2.4.1 First-Order Factors*

#### *2.4.1.1 Audit Firms*

Although relying on advanced audit technologies promotes more efficient and effective audits, there may be reasons that prevent audit teams from doing so. The audit firm's environment has a significant role in advocating for reliance on CA, but there are several factors that may hamper these efforts. These factors are related to risks, pressure, and facilitating conditions.

Risks is a factor that has long been a significant aspect of the planning phase in audit engagements. The assessment of risks involved in an engagement directly dictates the audit procedures needed. In a reliance context, Boatsman et al. (1997) used both factors to study auditors' reliance on decision aids. Boatsman et al. (p. 239) suggest that reliance on a tool is a "function of the auditor's concern over the severity of anticipated penalties for incorrect decisions". They then expand on that by reporting that there are two layers of potential consequences in the audit planning stage: (1) the costs of an incorrect planning decision and (2) the costs of an incorrect reliance decision. They find that the simultaneous increase in the cost of audit failure and audit inefficiency is expected to decrease the reliance on a tool (Boatsman et al. 1997). When the task environment is exacting for such results, users tend to depart from solutions, such as advanced technological tools that they cannot change or control to unaided procedures that at least have the appearance of control, such as traditional audit procedures (Hogarth, Gibbs, McKenzie, and Marquis 1991).



Another study that touches on the issue of reliance and risk is Malaescu and Sutton (2014). Their study suggests that the auditor's reliance on the internal audit's work is a function of detection risk and control risk. They also posit that even though the use of CA helps reduce detection risk substantially, the presence of a material weakness in a prior year would likely have a negative impact on the current year evaluation of control risk, and ultimately might mitigate the effect of using CA on the reduction of planned audit procedures by the external auditor.

Pressure is another factor that is attributed to the task environment and is closely related to risk. The severity of a penalty exaggerates the need for justification (Tetlock 1985). Furthermore, Arkes et al. (1986, p. 94) state that "In predicting outcomes important to us, we want to be able to account for all of the variance. If we use a standardized procedure, we know we cannot predict everything." So, when the situation in a specific engagement is risky and the stakes are high, it is reasonable to assume that auditors want to be able to account for all of the results themselves. This need for justification increases the reluctance to rely on a tool (Ashton 1990).

Both risk and pressure were clearly witnessed in the second case study. Even though the reliance on an advanced CA tool may have substantially reduced the detection risk associated with the engagement, the service company's apparent control risks may have precluded the external auditors from doing so. The presence of a material weakness in the previous three years probably created a significant amount of pressure on the external auditors to rely on evidence from the internal controls department.

Facilitating conditions is an important factor for assessing the use of information technology. It was repeatedly utilized in the literature to test for the use of technology by measuring variables that represent the availability of guidance, instruction, and assistance to using the relative tool within the firm (Thompson et al. 1991; Venkatesh et al. 2003). Venkatesh et al., p. 29 (2003) define facilitating conditions as “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the tool.” In a study by Venkatesh (2000), facilitating conditions was found to have a full mediation effect on the intention to use technology by effort expectance. Moreover, facilitating conditions is also expected to predict the intention of technology use in the absence of effort expectance (Venkatesh et al. 2003).

The factor that was adopted to auditing by Bierstaker et al. (2014) in their study about factors that influence auditors’ use of computer-assisted audit techniques. To have facilitating conditions in an audit context is to show that audit firms provide resources and support to their employees through specialized instruction, a support center, a hotline, or guidelines (Thompson, Higgins, and Howell 1991). The study by Bierstaker et al. (2014) finds that, facilitating conditions in an auditing context have a positive and significant effect on the use of computer-assisted tools in audits. The absence of facilitating conditions can be exemplified in the first case study when the external auditors communicated that they were compelled to sample because their own audit guidance required a documented periodic-based approach, instead of taking advantage of a superior testing approach. It was obvious that the firm’s guidelines at the time did not support the

engagement team in relying on a CA tool. Moreover, the use of advanced technologies that utilize population-based continuous analytics will probably expose fraud and abuse that could be overlooked in tradition audit processes and guidelines. Such a scenario might be considered a potential self-indictment, and presents firms with a dilemma “Do we want to find what we know we will find?”

#### *2.4.1.2 Task Complexity*

Task complexity is synonymous with either task difficulty (Kahneman, 1973; Bonner, 1994) or task structure (Simon, 1973; Bonner 1994) and is considered a critical task characteristic that has a significant impact on audit judgements (Bonner, 1994; Libby, 1985). It is generally known that individuals face tasks that significantly vary in complexity (Abdolmohammadi and Wright, 1987) and that tasks of differing complexity require different types of training (Bonner, 1994; Abdolmohammadi, 1987; Fleishman, 1975; Keen, 1978). Tasks are categorized along a continuum from repetitive structured tasks to novel unstructured tasks (Simon, 1960). The former category is considered relatively not complex and is associated with a well-defined problem and variables, well-specified alternatives for action, and limited amount of judgement (Gorry and Scott-Morton, 1971; Keen, 1978). Whereas the latter category is considered relatively complex and is associated with an undefined problem (few or no guidelines available), undefined alternatives for action, and significant amount of judgment (Gorry and Scott-Morton, 1971; Keen, 1978).

In a more recent and relevant study, Hampton (2005) used task complexity as a determinant of reliance on intelligent decision aids. The results of Hampton

(2005) illustrate that even though inexperienced auditors are more likely to rely on tools, experienced users will show increased reliance in situations where task complexity requires more cognitive effort to solve the problem relative to that of solving the problem without the tool.

The auditors' task of testing transactions in the first case is relatively routine and thus, the effect of task complexity on reliance would have been minimal. However, IT related activities are considered relatively sophisticated. For example, dealing with the lack of harmonization and integration of an ERP system and performing CA activities require some requisite technical skills, which current accounting professionals lack (Byrnes et al., 2012). Therefore, the effect of task complexity on reliance is expected to be present, since the task (which included auditing servers and testing them for security upgrades, vendor patch upgrades, and technical fixes) was associated with a problem that has minimal guidelines available and undefined alternatives for action.

#### *2.4.1.3 Tool*

A review of the auditors' reliance literature on decision aid and CAAT showed that the characteristics of the tool itself may encourage or discourage auditors' reliance on it through its technical features. Auditors tend to rely less on a tool that uses fewer cues for prediction even if the predictive accuracy is the same (Ashton 1990). For example, Davis (1994) shows that auditors using a statistical model with fewer variables were less willing to rely on the tool than auditors using an enhanced checklist with more for making going concern judgments. The effect of the technical features of the tool on reliance was also

previously discussed by Boatsman et al. (1997). In their paper about decision aid reliance, they stated that the technical features of a tool are one of three reasons for non-reliance. The technical features of the tool can be assessed in both cases discussed in the essay. Since the CA tools utilized in both cases were script-based, and the external auditors did not develop the tools themselves, it can be assumed that the external auditors opted to rely on their traditional sampling methods (that uses fewer cues). To them, the tool was standardized, and they had little control over its outcome relative to their traditional sampling methods.

#### *2.4.2 Second-Order Factors*

##### *2.4.2.1 Auditees*

Auditees effect reliance in two ways. First, as argued by Alles, Kogan, and Vasarhelyi (2002) for the case of continuous auditing, the driver of technology utilization in audits is the demand for such a service, rather than the supply of the technology. Management is usually reluctant or even unwilling to provide external auditors with necessary access to their systems (Byrnes et al. 2012). Disclosing information with higher frequency may not be ideal for them because these disclosures may expose managers to possible legal liability and competitive disadvantages (Alles et al. 2002). As a first step, the auditee should maintain tools that ensure the automation of data generation. The auditee should then request and push for the utilization of the available systems by auditors. Only then would the auditor be able to embrace the available technology and conduct the audit efficiently and effectively. Such a situation would be beneficial for both parties. The auditor would have more reliable evidence to conduct a high-quality audit, and the

auditee would sacrifice fewer resources due to the increased efficiency of the audit (Byrnes et al. 2012).

Second, the quality of internal audits affects the auditors' reliance decision on evidence from internal audits. Mat Zain, Zaman, and Mohamed (2015) study the effect of internal audit function quality and internal audit contribution to the external audit on external audit fees and reliance. The results of the experimental study show that as the quality of the internal audit function increases, the extent of external auditor's reliance on the internal auditor's work also increases, which ultimately reduces the external audit fees.

Based on the facts presented in the case studies, it can be inferred that the two factors related to auditees had opposite effects on reliance. On the one hand, the auditees developed a CA tool that can effectively monitor their sophisticated controls and provided the external auditors with complete access to their systems, a factor that may have positively affected reliance. On the other hand, the quality of the internal audits was questionable in the second case in prior years, a factor that may have effected reliance negatively.

#### *2.4.2.2 Regulators*

Standards set by the PCAOB and others do not preclude the use of CA with analytics on the population in audits; only the practice guidelines of the firms preclude the use of automation. The PCAOB, other regulators, and audit firms themselves hold audit firms accountable for implementing the guidelines and practices that they develop.

Change and development in the auditing field cannot be achieved without standards that facilitate that change. It has been argued that auditing standards and guidelines have not been refined to reflect the evolution of technology, processes, and controls adequately (Byrnes et al. 2012), a fact that encourages accounting firms to continue to rely on outdated periodic, sampling-based assurance. Since there is no professional auditing guidance on the theory or practice of advanced auditing methods like data analytics and CA (Byrnes et al. 2015), there is no clear owner to drive the needed innovation in assurance. The consequences of the vague standards with respect to reliance on CA tools were evidenced in the first case, where the senior external audit partner in charge of the audit engagement communicated his fear of the audit being disallowed by the PCAOB if traditional sampling was not conducted.

## **5. Discussion**

The key takeaway from the first case study is that current audit standards and firm guidance do not adequately support or encourage reliance on automation and analytics in the external audit practice. The specific audit firm audit practice guidelines are often slow to adopt emerging audit technology because of the massive investment in research, interpretation, and training that is required to change audit practice guidelines. Furthermore, the pressure and risks associated with auditing a multinational company coupled with the advanced, yet unobservable processes of CA tools may have discouraged the auditors from relying on it.

The established standards and specific firm audit program guidance need to change if external auditors are to leverage the available technology and improve the assurance, reporting, and operational processes effectively for their clients. Standard-setters (i.e. IAA, PCAOB, AICPA, GAAS, Organizations Internal Audit Guidance, etc.) can enhance audit procedures by introducing changes that encourage the rapid adoption of automated population-based audit procedures and related tools. For example, audit data standards that touch on data access, audit applications, and CA may facilitate the acquisition of data and improve the process of audit automation (Vasarhelyi et al. 2011). Similarly, new guidelines can deal with emerging technological challenges by formalizing these audit procedures in Generally Accepted Audit Standards (GAAS) (Bumgarner and Vasarhelyi 2018).

The second case study also highlights some of the reliance factors discussed above. The factors present in the first case, such as the lack of support for CA tools from audit standards and firm guidance, the absence of facilitating conditions within the audit firm, and the unobservable processes of the tool, still hold true in the second case. However, an additional significant factor is also present in this case, and that is the riskiness surrounding the internal controls of the auditee. The qualified opinions in the past years probably played a role in discouraging the auditors from relying on the CA tools. Malaescu and Sutton (2014) state that “A material weakness signals a deficiency in the control environment and translates to more scrutiny from the auditor who needs to perform enough work to assess if the problem identified in the previous year has been solved, and its impact on the audit of the financial statement accounts”. They



clearly show that the difference in reliance for a continuous audit versus a traditional audit is significant in the absence of a prior year weakness, but not significant if a weakness does exist.

Overall, the cases observed and documented above illustrate a multinational audit firm's hesitance to rely on automated auditing technologies. "As data was accumulated and analyzed, some trends were observed that ultimately provided a snapshot of where CA exists today. There are major challenges and barriers to achieving widespread adoption and proliferation of CA practices. Interestingly, this is particularly evident in the area of external auditing" (Byrnes et al. 2012, p. 53). It has been established that technologies such as CA can provide a greater level of assurance and deliver it faster than traditional methods.

The critical question that needs immediate discourse in the academic and professional auditing communities is: What must change in the profession to encourage rapid adoption and reliance on these important tools? The audit community, led by the regulators and standard setters, should recognize that the current audit practice of using often non-statistical periodic sample-based control reviews is less effective in providing timely and comprehensive assurance to investors and business owners. It is essential for both audit standard-setters and practitioners to keep up with the rapidly evolving business landscape. Audit standards are currently vague when it comes to leveraging automation and

analytics in the audit process.<sup>3</sup> Such vagueness creates a perception among auditors that conducting outdated sampling techniques is required. Thus, instead of pursuing innovative ways that push the boundaries of efficiency and effectiveness in audits, auditors may resort to the “inertia of the familiar” or opt for the most profitable short-term approach by propagating the antiquated legacy audit practices to keep the regulators and professional practice leaders content with the status quo. Reporting standards and practice guidelines (templates) should explicitly encourage rather than discourage or remain neutral about the use of automation and analytics in auditing.

Analytics should not be supplementary to sample-based manual controls, but rather should replace them outright. Otherwise, the technology would only add more work without materially improving control precision or assurance when automated controls are used on top of manual controls for the same risks and assertions. The need for a change in standards and guidance goes beyond just allowing or encouraging population-based monitoring instead of sampling. Standards need to incorporate agile and robust quantitative and qualitative audit processes that can deal with finding more anomalies, deficiencies, and fraud, encouraging appropriate management judgment to remediate, report, and investigate these issues efficiently and effectively.

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<sup>3</sup> Standards do not preclude auditors from relying on advanced tools, yet they lack guidelines and formalized audit procedures that can deal with technological advances.

Based on anecdotal evidence, developing and leveraging automated audit solutions and running automated population-based analytics for the first time on processes that have had pristine historic attestations from internal and external auditors using conventional sampling methods may uncover previously unrecognized deficiencies resulting from fraud, errors, and data integrity problems. Such tools effectively transform auditing from “trying to find a needle in a haystack” to “finding a haystack with thousands of needles”. The ultimate goal of utilizing technology in audits is to improve their effectiveness and efficiency (Stewart 2015). Although technology (whether it be Excel, ACL, IDEA, SAP GRC or the Internet) has improved the mechanics of how auditing tasks are performed (i.e., effectiveness), the processes themselves have scarcely changed for decades (Stewart 2015). To address audit efficiency, audit firms need to re-engineer their processes instead of merely automating or speeding up existing processes (AICPA 2012; Alles, Brennan, Kogan, and Vasarhelyi 2006; Davenport 1993; Hammer 1990; O'Leary 2000). In some processes, until appropriate process engineering can take place, many errors are continuously found as the audit report is written. With the increasing development of technology and analytics, issues concerning reasonable assurance, application of materiality, and the acceptable level of deficiency in a system should continue to be investigated. Furthermore, with the growing pressure to reduce the cost of compliance while significantly improving assurance and preventing fraud, audit firms need to overhaul their traditional revenue model of “billing out bodies and hours”. They should introduce new billing

models that are based on the engagement type and value of an assurance service, while considering the lengthy payback period for the new technology.

Auditors will inevitably detect more issues when they first start implementing automated auditing and before process re-engineering is completed. So, critical questions will arise such as:

- Do auditors really want to find all these issues in their processes?
- Will they need as many auditors if they do decide to use these tools?
- Do auditors have the necessary training to interact with sophisticated tools?

Further research is needed to address these questions.

## **6. Conclusion**

This paper discusses external auditors' non-reliance on CA tools. Specifically, the essay uses two case studies to highlight how audit firms resist the leveraging of CA tools that could have allowed them to conduct their audits more efficiently and effectively. After presenting the two cases, various factors that may be affecting reliance to CA tools are discussed. The most probable barriers to reliance on CA are categorized as first-order and second-order factors. The first-order factors relate to the audit firms, tasks, and tools, whereas the second-order factors consist of factors that are related to auditees and regulators.

Audit firms may affect their reliance on the use of technology in audit via their environment. The task itself may encourage or discourage reliance, depending on its complexity. The tool may affect reliance through its provided features. Reliance may also be affected by auditees' refusal to grant access to

their data or simply by not demanding and preparing the necessary secure platform needed to share audit data. Finally, standard setters' role in discouraging reliance comes from the fact that their standards and guidance are non-existent or vague when it comes to utilizing automation and analytics.

Technologies like CA and analytics can consistently provide a greater level of assurance and deliver it more quickly than traditional audit processes. Both case studies illustrated how auditors, for a variety of reasons, often fail to take full advantage of automated tools in conducting their audits, a phenomenon that will continue to occur if formal audit standards and individual firm guidance do not encourage the use of automation and analytics. It is essential for both audit standards and practice to keep up with the emerging business landscape. The need for a change in standards goes beyond replacing sampling and encouraging population-based monitoring. Standards need to incorporate agile and robust audit processes that can detect more anomalies, deficiencies, and fraud, while providing clear remediation and reporting guidance for how auditors should respond. Legacy audit remediation and reporting guidance need to be re-engineered to support finding more deficiencies on a continuous basis. The traditional external audit revenue model of billing hours and bodies needs to move toward a value-based engagement billing model.

Advanced technological tools are continuously introduced to the audit process. However, literature regarding their actual use in practice is scarce. This paper contributes to the literature by shedding light on two actual cases and highlights how audit firms interact with a CA system in an engagement. The cases

will be more pronounced as many business leaders who adopting technology and analytics (e.g. The Internet of Things) in other areas of business and government begin to insist that their internal and external auditors use this same technology. Discussion of the cases highlights some of the barriers to embracing CA and may encourage the parties involved to address them.

The study has some limitations that can be addressed in future work. Since the case studies are isolated incidents and were collected from one side of the engagement, it would be unrealistic to generalize the reliance factors to other situations. While this paper provides some insight into the reliance on CA, further research is needed to fully explore and explain other factors. Future research can present different cases to test whether the circumstances change. Furthermore, future work can introduce external auditors' views in order to have a more complete understanding of issues related to auditors attitudes toward reliance on CA tools.

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## **Chapter 3**

# **The Effect of Transparency, Accountability, and Integrity on Corruption: A Study in a Resource-Rich Developing Country**

### **1. Introduction**

Corruption is destructive. It negatively affects fairness, stability, and justice (Sampford et al. 2006), and is considered a reflection of a country's legal, economic, cultural, and political institutions, and a reliable indicator of weaknesses and failures in government (Lambsdorff 2007; Svensson 2005). These devastating outcomes encourage researchers and non-governmental organizations (NGOs) to propose various measures to combat or mitigate corruption. Nonetheless, the effect of these measures on corruption and their relationships to one another is seldom studied due to the scarcity of such information. This paper utilizes one of the most popular anti-corruption models to study the effect of its measures on corruption and the relationship among the measures themselves.

In countries where citizens elect representatives and government administrators to act on their behalf, the legitimacy of such a principal-agent relationship is based on trust that can only be sustained by a complex relationship between information, transparency, accountability, and participation (Tyler 1998; Kolstad and Wiig 2008). Moreover, governmental actions need to be assessed and

validated by information that is produced by a combination of transparency and accountability to provide an ongoing basis for the consent of the governed (Harrison and Sayogo 2014). Furthermore, experts in governance include increases in transparency, accountability, and institutionalization of codes of conduct to be among the major priorities for public sector reform (Alberti and Sayed 2007).

The Transparency International Toolkit report (2004) states that corruption exists when the risk of engaging in such acts is low, the penalties are mild, and the rewards are great. Robert Klitgaard (1998) identifies corruption as having monopoly control of public resources and officials having discretionary powers in the absence of accountability.

$$\textit{Corruption} = \textit{Monopoly} + \textit{Discretion} - \textit{Accountability}$$

The United Nations Development Programme (UNDP) modifies Klitgaard's model by adding integrity and transparency to accountability. Thus, identifying these three characteristics is crucial to prevent or fight corruption.

$$\begin{aligned} \textit{Corruption} = & (\textit{Monopoly} + \textit{Discretion}) - (\textit{Accountability} + \textit{Integrity} \\ & + \textit{Transparency}) \end{aligned}$$

The study of these anti-corruption factors and the relationships among them is limited in the literature. Previous research in public relations studies the role of integrity and accountability in promoting a reputation for transparency and efforts toward transparency (Rawlins 2009). In the organizational behavior literature,

transparency has been studied as a factor in ethical organizational culture (Kaptein 2008).

This paper studies the relationships among these measures from a corruption standpoint. Specifically, the effect of these measures on corruption and the effect of transparency in governmental activities and procedures on accountability and integrity are explored.

Although governmental data in the form of financial reports is easily attainable and taken for granted in developed countries, the situation is hardly the same in developing countries. Corruption is a huge problem in developing countries and even more so in developing countries that are rich in natural resources. It is central in explaining why resource-rich countries perform badly in terms of socioeconomic development, a phenomenon that has been termed the resource curse (Kolstad and Wiig 2008). Therefore, there is a pressing need for alternative sources of information. One such information source can be obtained from an important stakeholder in any organization: Employees.

Traditionally, verification of any organizationally responsible behavior is carried out by an independent third party. However, third parties “audit” organization-sourced information and do not take stakeholders’ opinions into consideration (Rawlins 2009). Therefore, allowing stakeholders to provide the evaluation is a welcome alternative (Rawlins 2009).

All stakeholders have a right to access information that affects them and allows them to reason more clearly when making decisions (Rawlins 2009; Sullivan

1965). Since employees are in a unique situation, they tend to be more intimate with an organization than other stakeholder groups, due to the amount of daily interaction (Rawlins 2009). Since opinion surveys are the most common tool for assessing corruption levels (Sampford 2006), it has been suggested to utilize the employees' positions for testing anti-corruption measures in their public institutions (Benner and Haan 2008).

The use of an alternative source of data can provide insight and an understanding of the processes and working environments of governmental agencies, which may be a good approximation of what traditional reports ultimately strive to achieve. For example, knowing that the aim and processes of each individual agency are clearly stated and communicated to the employees and that the rules/regulations are in place and enforced, may provide reassurance to the public. Furthermore, alternative data from third parties, such as civil society organizations (CSOs), can prove to be more effective due to their independence and lack of motive for falsifying the data or selectively disclosing it. Some arguments have suggested that CSOs play an important role in bridging the gap between transparency and accountability (Zyl 2014). For instance, Peixoto (2013) discusses the role of CSOs in the transparency-accountability equation, Fox (2007) mentions the pressure that they can exert on oversight institutions, and Khagram et al. (2013) discuss the ability of CSOs to increase the conversion rate from participation to public accountability.

The archival data utilized in the study was provided by the Kuwait Transparency Society – Transparency International. It comprises sixteen survey

questions, based on a Likert scale, concerning 53 governmental agencies in Kuwait. These survey questions are categorized into one corruption construct and three anti-corruption constructs. Using these constructs, this paper employs a structural equation model (SEM) to measure the relationships among the anti-corruption constructs and their effect on corruption. Results find that the anti-corruption measures explain 39.8% of the variance in corruption. However, the direct effect on corruption is not equal among the measures. The results show that integrity has the strongest effect on corruption, followed by accountability, and transparency. It is also worth noting that the effect of transparency on corruption is not significant. Furthermore, the analysis of the relationship among the anti-corruption constructs shows that transparency has a strong and significant effect on accountability and that accountability has a strong and significant effect on integrity. Overall, the results illustrate that transparency is not an end of its own, as believed by pro-transparency advocates (Tan 2014). It should be accompanied by a system that holds individuals accountable and promotes a culture of integrity.

This study contributes to the public administration and governmental accounting literature by empirically testing an important topic. The paper enriches both literatures with concepts that are discussed in public relations, organizational behavior, and corporate governance papers. Even though corruption and anti-corruption measures are heavily researched, they are rarely tested empirically with actual data in the literature. This study utilizes a unique data set to test the relationships among three significant anti-corruption measures and their effect on corruption. Although the setting of this study is unique, the constructs are general



and applicable to different countries, not-for-profits, and private organizations. Moreover, considering the accelerated development of technology and abundance of data, the results of this study highlights the significance of using alternative, non-traditional information to solve or understand a phenomenon. Specifically, the findings of this paper may also aid in the current push for governmental agencies to provide electronic and standardized reports and the demand for analytical tools to aid citizens (i.e. Armchair Auditors) to evaluate them (O'Leary, 2015).

The next section reviews relevant research in corruption and discusses corruption, transparency, accountability, and integrity. Section 3 presents the relationships among these three elements along with the proposed hypotheses. After that, Section 4 develops the proposed model for the study and presents the data used. Finally, Sections 5 and 6 present the results and the concluding remarks.

## **2. Literature Review**

### *2.1 Corruption*

The topic of corruption has received great interest and international attention in the past two decades, resulting in a large number of policy initiatives that are aimed at reducing corruption (Peton and Belasen 2012). For instance, the World Bank has supported more than 600 anti-corruption programs and has identified corruption as one of the biggest obstacles to economic and social development (Peton and Belasen 2012). The International Monetary Fund (IMF)

has expressed similar concerns and announced a policy in 1997 to withdraw support from countries where corrupt activities have significant economic implications (IMF 1997; Peton and Belasen 2012).

Transparency International defines corruption as the abuse of *entrusted* power for private gain. So, whether the activity is public, private, or non-profit, and whether it was carried out in New York or Kuwait, corruption will occur when someone has monopoly power over a good or service, has the discretion to decide who will receive its benefit and how much they will get, and is not accountable.

Furthermore, Kolstad and Wiig (2008) mention the commonly used distinction between political corruption and bureaucratic corruption. Political corruption is the abuse of office by those who are in charge of making the rules, which is most prevalent in resource-rich countries. By contrast, bureaucratic corruption takes place at the implementation side of public policies. This paper focuses on the latter.

Klitgaard (1998) states that corruption is an act of calculation, not passion. When an opportunity for a large bribe presents itself, the probability of being caught is slim, and the consequences of being caught meager, many officials will succumb to temptation. Although there are numerous methods to combat corruption like economic and media freedom (Peton and Belasen 2012), transparency is the most obvious. Lack of transparency makes corruption less risky and more attractive. Moreover, the absence of transparency makes it harder to use incentives that make public officials act ethically due to the direct impact of transparency on detection and the probability of getting caught (Kolstad and Wiig 2008). "Corruption

is not just a question of low-level public servants filling their pockets at the expense of common citizens, but is an institutional and political problem that requires structural solutions” (Sandoval-Ballesteros 2015). Therefore, the true concern is a corrupt system that will disrupt the primary functions of government.

## *2.2 Transparency*

Transparency is defined as the stakeholders’ timely and reliable access to relevant information (Bellver and Kaufmann 2005). It is said that “The most direct way to eliminate problems of moral hazard is to make an agent’s behavior more observable” (Stasavage 2003). However, transparency is not only considered a tool against corruption, but also the advocates of transparency increasingly point out that the right to know is a fundamental human right (Birkinshaw 2006; UN 1948). Sullivan (1965) identifies two rights that are owed to all people: (1) the right to true information in matters affect them; and (2) the right to participate in decisions that affect them. This might explain the momentum gained by the transparency movement in the last decade with international organizations and nongovernmental organizations (NGOs) promoting transparency as an essential tool for greater accountability and limited corruption (CEPA 2009; IMF 2008; Islam 2006; Kaufmann et al. 2002; Kurtzman et al. 2004; OECD 2002; UN-Habitat and Transparency International 2004; UNODC 2004). The growing interest in transparency is also reflected in the introduction of almost 90 laws on national access to information throughout the world (Vleugals 2011) and the competition between governments to improve their rankings on the Transparency International,

Global Integrity, Budget Accountability, World Bank, and Latin American Barometer "scoreboards" (World Bank 2013).

Arguments that support the potential benefits of transparency and its positive effect on corruption are common (IMF 2008; Islam 2006; Kaufmann 2002; Kurtzman et al. 2004; Lindstedt and Naurin 2010; Montinola and Jackman 2002; OECD 2002; Reinikka and Svensson 2005; Rose-Ackerman 1999; Siegle 2001; UNODC 2004). Political theorists believe that democracies cannot function without information (Norris 2001). It has also been debated that transparency improves the ability to monitor and influence governance, which can then lead to greater political stability by limiting corruption (Xiao 2011). Transparency has also been viewed as a key factor in reducing corruption in natural resource-rich countries as it has accomplished in Singapore (Rodden 2004; Kolstad and Wiig 2008). "Pro-transparency arguments tend to combine both normative and technocratic justifications, asserting transparency as an end in itself and assuming that access to information improves both welfare and accountability" (Tan 2014, p.38).

Other studies believe that the effect of transparency on corruption is conditional. By that, they mean that transparency cannot turn things around by itself, but has to be complemented by the ability to process and act on the information (Kolstad and Wiig 2008). Some studies also mentioned that economic freedom and education are essential precedents to transparency in fighting corruption. Bac (2001) and Kolstad and Wiig (2008) state that transparency may also increase corruption by identifying the relevant officials to bribe by revealing to potential bribers whom to contact in order to acquire an unfair advantage. Persson

et al. (2010) and Bauhr and Grimes (2014) posit that revealing corruption may erode institutional confidence and breed resignation and withdrawal from politics instead of encouraging citizens to fight for a better government.

### *2.3 Accountability*

From the previous discussion, it can be inferred that transparency is not just a goal but a tool that can be used and taken advantage of in the fight against corruption. Information, the output of transparency, enables citizens to assess the performance of their governments and detect corruption in order to hold the perpetrators accountable (McGee and Gaventa 2011; Michener and Bersch 2013; Louren 2013; Wong and Welch 2004). It has been suggested that these accountability processes ultimately “curtail fraud and corruption, increase fiscal responsibility among government actors, improve the public's understanding of why performance goals may not be met, and help to establish trust” (Harrison and Sayogo 2014, p. 516).

Public officials usually do not get high-powered incentive contracts. Instead, they receive a fixed salary. Thus, keeping or losing their jobs is the only way to reward or discipline them. Due to frustration with elections and bureaucratic procedures as the sole instruments for holding officials accountable for their decisions, developments in the form of transparency and accountability initiatives have been initiated (Lambert-Mogiliansky 2015). These new initiatives not only mitigate the weaknesses of the bureaucratic process but also allow the public to act by involving society as a whole in the accountability process (Kaufmann 2002).

This line of reasoning goes hand in hand with the World Bank's definition of social accountability: "the range of actions and strategies beyond voting, that societal actors – namely the citizens – employ to hold the state to account" (World Bank 2013). Nonetheless, some see accountability as a complex concept. Malena et al. 2004 believe that it is comprised of three elements: answerability, enforcement, and responsiveness. Answerability is the obligation to justify a certain action. Enforcement refers to the sanction if the action or the justification is not satisfactory. Responsiveness is the willingness to respond to demands made.

#### *2.4 Integrity*

To have integrity is to be honest and have strong moral principles. It is also regarded as one's self-regulation when it comes to loyalty, dedication, effort, and initiative to the organization. These traits usually help achieve the organizations' goal (Barney 1986; Barney and Hansen 1994; Eisenberger et al. 1987). Integrity is a quality that is needed in all facets of life, and even more so, when in a position of a trustee. Fellow citizens trust officials to provide certain services without engaging in corrupt activities. In order to achieve that, the public must have a sufficient amount of trust and commitment to the government (Witherell 2002). The integrity of the officials is essential to achieve that trust and commitment (Tsou and Wang 2008).

Although integrity is rarely acquired by training or education (Caligiuri and Di Santo 2001), it is highly connected to the promotion of governance, thus determining the public's trust in the government (Tsou and Wang 2008). Furthermore, employees' general moral intuitions may not be sufficient to

distinguish between ethical and unethical conduct in the workplace (Kaptein 2008). It has been found that the absence or vagueness of guiding references and moral expectations within an organization is associated with a higher risk of unethical conduct and encourages employees to hide behind their ignorance (Kaptein 1998; Bird and Waters 1989; Jackson 2000; Bovens, 1998; and Tyler and Blader 2005). Consequently, maintaining a culture of integrity and trust in the organization stems from the system that is in place.

### **3. Hypothesis Development**

After reviewing the relevant literature on transparency, accountability, and integrity and understanding their role and significance in fighting corruption, it is important to understand the relationships between them. Measuring the effect of transparency on accountability and integrity will reveal the significance of transparency in the battle against corruption and shed some light on the conflicting views of transparency in the literature, and may also encourage governments and stakeholders to pursue further transparency initiatives or discourage them from doing so, depending on the results.

The benefits of transparency are better understood if good government and accountability are considered in the light of principal-agent theory (Rose-Ackerman 1999). The principal-agent theory states that information asymmetry is the primary obstacle that prevents principals from monitoring and holding agents accountable (Bauhr and Grimes 2014). Information is vital in enabling the public to detect corruption and hold governments accountable (McGee and Gaventa 2011;

Michener and Bersch 2013). However, the accountability mechanisms available to sound the alarm determine the outcome of such instances. Previous studies have found that important conditions have to be achieved for transparency to produce the expected benefits regarding better government (Bastida and Benito 2007; Bauhr and Nasiritousi 2012; Fenster 2006; Kolstad and Wiig 2009; Lindstedt and Naurin 2010; Stasavage 2004). In some cases, increased transparency might create a public perception that corruption is the strategy chosen by most, which may undermine the incentive to take action or even encourage them to do the same (Bauhr and Grimes 2014).

H1: Higher levels of transparency will be positively associated with greater accountability.

Integrity is considered closely related to the absence of fraud and corruption (Benner and Haan 2008). Integrity is not regarded exclusively as a quality of individuals. It can be a quality for organizations as well. The act of corruption or improper behavior carried out by officials in the public sector is a crucial aspect of measuring organizational integrity (Sampford, et al. 2006). These kinds of acts can be mitigated by policies and training sessions that raise awareness and by establishing guidance mechanisms that assist officials in identifying the right course of action in difficult situations (Transparency International – ACH 2008).

Transparency within organizations is just as important as transparency with external stakeholders. The flow of information within the organization, encouraging employee participation in decisions, and providing feedback are vital in maintaining a positive working environment. Kaptein (1998; 2008) finds that barring employees



from obtaining adequate information needed to understand their tasks and responsibilities increases the risk of unethical conduct. The study also posits that employees who are not taken seriously or treated fairly may resign to deliberately cause damage to the organization in order to balance the scales of justice. On the other hand, promoting transparency in an organization encourages employees to modify their behavior and that of their co-workers, supervisors, or subordinates. Kaptein (2008, p. 926), concludes that "Mistrust and a hostile work environment makes it difficult, if not impossible, to comply with the ethical standards of the organization."

H2: Higher levels of transparency will be positively associated with higher levels of integrity.

Kolstad and Wiig (2008) believe that transparency can maintain norms of integrity and trust through its ability to reduce bureaucratic corruption by making corrupt acts riskier and reduce political corruption by making politicians more accountable to the public. Within organizations, employees are also deterred from misbehavior if they expect to be punished and if the severity of punishment outweighs the potential reward (Cressey 1953; Sutherland 1940; Kaptein 2008). If the organization rewards unethical behavior or fails in punishing it, it sends a clear signal that this kind of behavior is acceptable or desirable (Ball, Trevino, and Sims 1994). Thus, holding perpetrators accountable and applying sanctions not only maintains a fair environment, but also deters unwanted behavior from employees.

H3: Higher levels of accountability will be positively associated with higher levels of integrity.

Corruption occurs when someone has power over a good or service and has the discretion to decide who will receive it and how much they will get (Klitgaard 1998). However, corruption is mitigated by transparency, accountability, and integrity. Since corrupt activities are mostly free of any paper trails, the following hypotheses the following hypothesis is investigated by utilizing perceptions of corruption, which are based on individual's actual experiences and considered the best and only source of information in the absence of a paper trail (Kaufmann, et al. 2006).

H4a: Higher levels of transparency will be positively associated with lower levels of corruption.

H4b: Higher levels of accountability will be positively associated with lower levels of corruption.

H4c: Higher levels of integrity will be positively associated with lower levels of corruption.

#### **4. Research Method**

A structural equation model (SEM) is used to test the proposed hypotheses. The survey data was obtained from Kuwait Transparency Society – Transparency International. The survey was conducted in 2014 for a perception of corruption

*Figure 7. Corruption and the three anti-corruption measures: transparency, accountability and integrity*

index for all governmental agencies. The questionnaire was designed by a committee of experts, which included academics from Kuwait University and directors in the Kuwait Transparency Society. The committee designed the survey by interacting with different regulatory agencies in Kuwait, similar movements in the region, and experts in the field of reform. The survey was executed by an experienced third party, Gulf Opinions Center for Polls and Statistics, and supervised by the committee at Kuwait Transparency Society after getting approval from the Central Statistical Bureau. It is also worth noting that the third party was instructed by the committee to ensure the anonymity of the respondents and to use a stratified sampling method in which a random sample was chosen from the different employee/managerial levels. Moreover, the sample was chosen in proportion to the population in each agency. For example, more females were included in the sample of the Ministry of Education and fewer in the Ministry of Interior. Finally, the survey used a Likert scale for its sixteen questions concerning 4,373 employees in 53 governmental agencies in Kuwait. Table 1 shows a demographic summary of the participants.

<b>Gender</b>		
	<b>Number</b>	<b>Percentage</b>
Male	1534	35%
Female	2586	59%
Unknown	253	6%
<b>Education</b>		
High School	456	10%
Diploma	1614	37%
Bachelor	1841	42%
Graduate	221	5%
Unknown	241	6%
<b>Position</b>		
Employee	3467	79%
Department Head	346	8%
Supervisor	103	2%
Manager	54	1%
Unknown	403	9%

*Table 1. Demographic summary of participants*

The survey questions presented to the employees concerned the previously discussed issues of transparency, accountability, integrity, and corruption. The transparency construct is comprised of five items that mainly measure the

disclosure of relevant information to employees and whether an effective communication channel exists between the employees and the executives. The accountability construct is comprised of four items that measure whether violators of agency rules are held accountable, the existence of an independent internal control unit, commitment to implementing rules, and whether complaints are dealt with effectively. The integrity construct is comprised of five items that measure whether employees perform unethical misconduct and whether the agency promotes ethical behavior via training, ethical standards, and protection of whistleblowers. The corruption construct is comprised of two items that measure financial and managerial violations. The four constructs and their corresponding items are presented in Table 2. It is worth noting that all of the questions were formatted to elicit positive responses as 5 and negative responses as 1. Thus, the results of the study show the effects on corruption as positive even though they are negatively related.

<b>Constructs</b>	<b>Indicator</b>	<b>Statement</b>
<b>Transparency</b>	T01	Agency's aim is clearly stated and effectively communicated
	T02	Availability of a procedure manual
	T03	Availability of a job description guide
	T04	Rights and duties are disclosed
	T05	Effective communication channels
<b>Accountability</b>	A01	Violators of managerial and financial rules are held accountable
	A02	Internal control unit
	A03	Commitment to implementing rules and regulation
	A04	Complaints are effectively dealt with
<b>Integrity</b>	I01	Public property exploitation
	I02	Prohibition of accepting gifts
	I03	Promoting ethics and integrity training
	I04	Ethical standards are clear, disclosed, and implemented
	I05	Encouragement and protection of whistleblowing
<b>Corruption</b>	C01	Financial violations
	C02	Managerial violations

*Table 2. Summary of results*

Furthermore, the survey instrument encourages the objectivity of the respondent's answers and increases the reliability of their responses by standardizing the answers to each statement. For example, with regard to the whistleblowing item in the integrity construct, each of the five choices had a specific

requirement: (1) No mechanism exists for whistleblowing, and whistleblowers may be harmed; (2) No mechanism exists for whistleblowing, but whistleblowers will not be harmed; (3) A whistleblowing mechanism exists but is not certified (not documented); (4) A certified whistleblowing mechanism exists, without documenting the anonymity or protection of the whistleblower; (5) A clear certified whistleblowing mechanism exists, employees were notified of its existence, guarantees whistleblower anonymity, and carefully follows up on complaints. The reliability and validity of the factors are discussed in Section 5. The complete survey instrument can be viewed in English and Arabic in Appendix A and B, respectively.

#### *4.1 Research Design*

This study utilizes multivariate analysis using SEM. SEM is a comprehensive statistical approach used to test relationships between the observed and latent variables of a hypothesis. It is a methodology for representing, estimating, and testing a theoretical network of mainly linear relationships between variables (Hoyle 1995). It tests the hypothesized patterns of directional and non-directional relationships among a set of observed and unobserved variables. The following sections discuss the methodology and experimental design in more detail.

There are two types of models for measuring latent variables: reflective measurement models and formative measurement models (Diamantopoulos and Winklhofer 2001; Coltman et al. 2008; Sarstedt et al 2017). Reflective measurement models have direct relationships between the constructs and their

respective indicators, and the indicators are considered error-prone manifestations of the construct (Bollen 1989; Sarstedt et al. 2017). In reflective models, indicators are required to be a representative sample of all items in the construct's conceptual domain (Nunnally and Bernstein 1994; Sarstedt et al. 2017), and thus should be highly correlated (Edwards and Bagozzi 2000).

In formative measurement models, the constructs are comprised of a linear combination of a set of indicators. Since "variation in the indicators precedes variation in the latent variable" (Borsboom et al. 2003, p. 208), formative indicators do not necessarily have to correlate as strongly as in reflective measurement models (Sarstedt et al. 2017). For the purposes of the study, a formative measurement model is used for the latent variables.

The two popular SEM approaches are Partial Least Squares (PLS) and Linear Structural Relationships (LISREL) modeling. Both PLS and LISREL can construct structural relationships among latent variables. Since the constructs in this model are measured using formative indicators, and using covariance-based modeling techniques like LISREL to test such models can result in an unidentified model, this study uses PLS (Kline 2006). The fact that PLS can deal with formative indicators and analyze complex models might explain its popularity in accounting research, such as Hall (2008), Dowling (2009), Chapman and Kihn (2009), Elbashir et al. (2011), Lee et al. (2011), and Nitzl (2016).

PLS is a component-based SEM technique that tests psychometric properties of the scales used to measure the constructs and simultaneously examines the strength of the relationship between them (Chin 1998; Hulland



1999). It estimates the parameters of a set of equations in a structural equation model by combining principle components analysis with regression-based path analysis (Sarstedt et al. 2017; Mateos-Aparicio 2011).

The path model is comprised of two elements: (1) The structural model (Inner model), which represents the structural paths between the constructs, and (2) The measurement model (Outer model), which represents the relationship between each construct and its associated indicators.

The latent variables in the model are classified as exogenous if the variable is independent or endogenous otherwise. Endogenous latent variables have an error term, which reflects the sources of variance not captured by antecedent constructs in the structural model. Furthermore, the strength of the relationships between latent variables is represented by path coefficients, which are determined by the regressions of each endogenous latent variable on their direct predecessor constructs.

## **5. Results**

Evaluating the results of PLS corresponds with the two elements that comprise it. First, the measurement model is evaluated by testing the convergent validity, discriminant validity, collinearity, and significance and relevance of indicator weights. The next step is to support the structural model by testing collinearity, explanation of endogenous latent variables, predictive relevance, significance and relevance of path coefficients, effects size of path coefficients, and holdout sample validation.

PLS results are presented in Figure 8 below. The numbers on the path relationships represent the standardized regression coefficients, and the numbers in the circles of the endogenous latent variables represent  $R^2$  values.

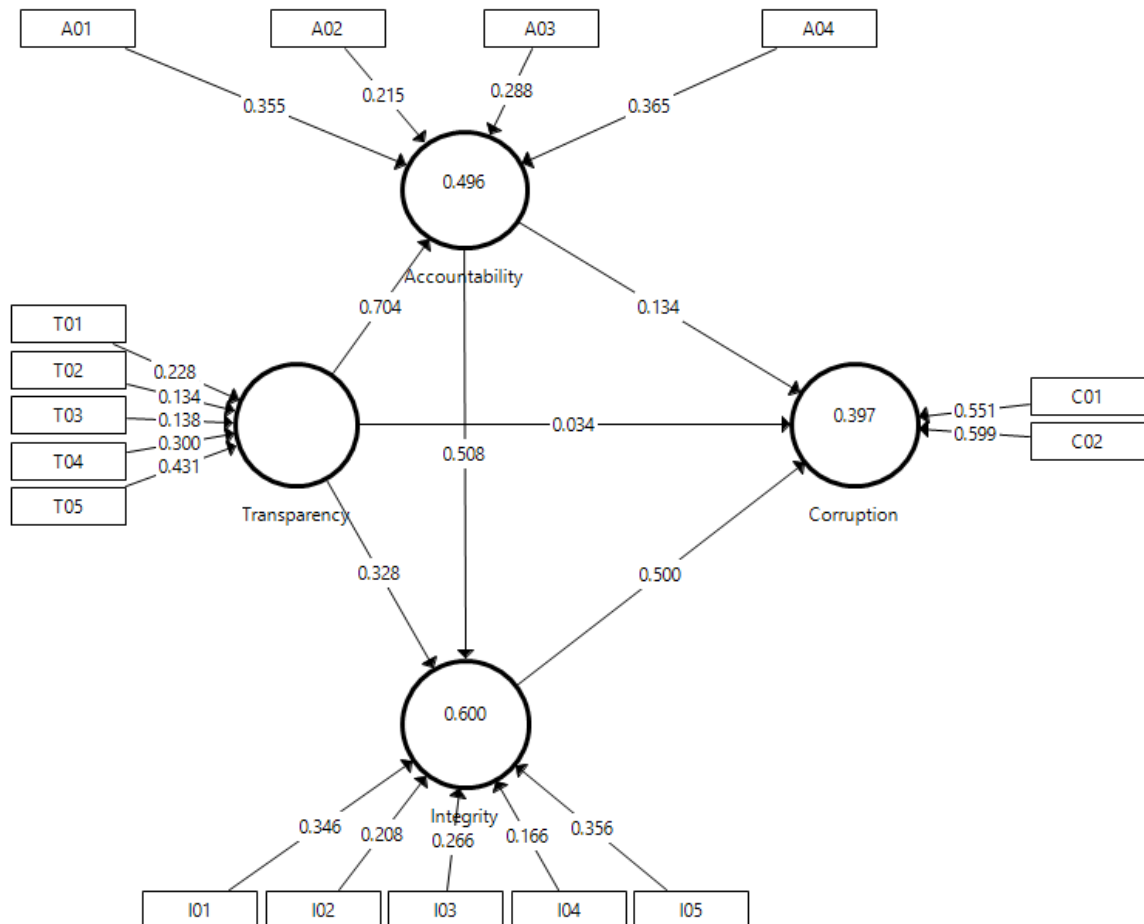


Figure 8. PLS results

### 5.1 Measurement Model

In constructs that are modeled reflectively, convergent validity is assessed by indicators' loading and average variance extracted (AVE) (Van den Bosch 1999). Since the constructs are formative, tests are done only if the weights of all

the indicators are statistically significant. The indicator's weight significance is tested by utilizing the bootstrapping procedure at the 0.05 significance level. The results in Table 3 show that all indicator weights are significant, indicating their significant contribution to the measured construct (Elbashir et al. 2011).

<b>Indicators</b>	<b>Original Sample (O)</b>	<b>Sample Mean (M)</b>	<b>Standard Deviation (STDEV)</b>	<b>T Statistics ( O/STDEV )</b>	<b>P Values</b>
<b>A01</b>	0.355	0.355	0.017	20.797	0.000
<b>A02</b>	0.215	0.216	0.018	12.023	0.000
<b>A03</b>	0.288	0.287	0.019	15.438	0.000
<b>A04</b>	0.365	0.364	0.017	21.357	0.000
<b>C01</b>	0.551	0.55	0.023	23.479	0.000
<b>C02</b>	0.599	0.599	0.023	26.29	0.000
<b>I01</b>	0.346	0.347	0.015	23.804	0.000
<b>I02</b>	0.208	0.209	0.015	13.594	0.000
<b>I03</b>	0.266	0.266	0.018	14.669	0.000
<b>I04</b>	0.166	0.166	0.018	9.111	0.000
<b>I05</b>	0.356	0.356	0.017	20.704	0.000
<b>T01</b>	0.228	0.228	0.021	11.084	0.000
<b>T02</b>	0.134	0.134	0.023	5.801	0.000
<b>T03</b>	0.138	0.137	0.021	6.696	0.000
<b>T04</b>	0.3	0.299	0.021	14.074	0.000
<b>T05</b>	0.431	0.432	0.019	22.525	0.000

*Table 3. Results of the bootstrapping procedure*

Discriminant validity is then tested by ensuring that each measurement item has a higher loading on its assigned factor than on any other factor in the model (Chin 1998; Gefen et al. 2000). As shown in Table 4 below, all of the constructs meet that criterion. The results are also tested for collinearity, which is indexed by the variance inflation factor (VIF) statistic. There are several cutoff points for VIF as suggested in the literature, such as 2.50 (Allison 1999), 4.00 (Miles and Shevlin 2001), and 10.00 (Everitt 1996). As shown in Table 4, none of the predictors had VIF values greater than 2.50, which suggests that collinearity is not at a critical level.

Indicators	Accountability	Corruption	Integrity	Transparency	VIF
<b>A01</b>	0.829	0.465	0.648	0.527	1.826
<b>A02</b>	0.773	0.402	0.596	0.522	1.813
<b>A03</b>	0.822	0.444	0.581	0.599	1.896
<b>A04</b>	0.828	0.404	0.585	0.636	1.747
<b>C01</b>	0.428	0.857	0.541	0.383	1.356
<b>C02</b>	0.487	0.881	0.541	0.434	1.356
<b>I01</b>	0.383	0.532	0.664	0.394	1.191
<b>I02</b>	0.467	0.477	0.682	0.426	1.433
<b>I03</b>	0.628	0.435	0.799	0.608	2.064
<b>I04</b>	0.605	0.39	0.752	0.585	2.053
<b>I05</b>	0.678	0.443	0.816	0.565	1.856
<b>T01</b>	0.53	0.381	0.526	0.769	1.908
<b>T02</b>	0.523	0.36	0.527	0.757	2.213
<b>T03</b>	0.508	0.331	0.506	0.724	1.918
<b>T04</b>	0.577	0.396	0.593	0.841	2.07
<b>T05</b>	0.627	0.397	0.573	0.86	1.719

Table 4. Discriminant validity and collinearity

Construct reliability is determined by the correlations between the indicators. Since correlations between formative indicators may be positive, negative, or even zero (Bollen 1984; Diamantopoulos and Winklhofer 2001), reliability in an internal consistency sense is not meaningful (Bagozzi 1994; Hulland 1999). Moreover, internal consistency is of little importance because even two indicators with a negative relationship can be meaningful indicators of a certain

construct (Nunally and Bernstein 1994). Nonetheless, additional tests were done to show that the results are not driven by how the constructs are modeled (Chwelos et al. 2001; Dowling 2009; Elbashir et al. 2011). An alternative measurement model where all the constructs were modeled as reflective is also examined. This allowed computation of composite reliability. As shown in Table 5, all constructs have a composite reliability over the cutoff of 0.70, as suggested by Straub (1989).

Constructs	Composite Reliability
Accountability	0.888
Corruption	0.861
Integrity	0.866
Transparency	0.902

*Table 5. Composite reliability*

### *5.1 Structural Model*

The assessment of the structural model begins by checking for collinearity issues. The VIF values of all sets of predictor constructs are examined. Five VIF values are found are at or below the lowest threshold of 2.5 and one at 2.63, which is close to the lowest threshold and significantly below alternative cutoff points in the literature. These results support the conclusion that collinearity is not a critical issue, as shown in Table 6.

	Accountability	Corruption	Integrity
Accountability		2.63	1.98
Integrity		2.5	
Transparency	1	2.25	1.98

Table 6. Collinearity of the structural model

After that, the path coefficients and  $R^2$  are investigated to assess how much the model explains about the endogenous latent variables. The results in Figure 8 above show that Transparency, Accountability, and Integrity explain 39.8% of the variance in Corruption. Specifically, the results show that Integrity has the strongest effect (0.500) on Corruption, followed by Accountability (0.134), and Transparency (0.034). Bootstrapping results show that the effects of Integrity and Accountability on Corruption are significant, while Transparency does not have a significant effect at the 5% probability of error level.

Next, the relationship among the three anti-corruption variables is investigated. Table 7 shows that Transparency has a significant and substantial effect on both Accountability (0.704) and significant and weak effect on Integrity (0.328). Accountability also has a significant and moderate effect on Integrity (0.508) (Henseler et al. 2009; Hair et al. 2011).

	Path Coefficient	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Accountability-> Corruption	0.134	0.023	5.748	0
Accountability-> Integrity	0.508	0.014	35.103	0
Integrity-> Corruption	0.5	0.023	21.863	0
Transparency-> Accountability	0.704	0.008	83.192	0
Transparency-> Corruption	0.034	0.02	1.698	0.09
Transparency-> Integrity	0.328	0.015	21.277	0

*Table 7. Path coefficients*

The indirect effect of exogenous constructs are also taken into account and the total effects between constructs are assessed to provide a more comprehensible picture of the structural model (Nitzl et al. 2016). The results in Table 8 show that Transparency has an indirect effect of 36% on Integrity and 44% on Corruption which totals to 69% and 47% respectively. Moreover, Accountability has an indirect effect of 25% on corruption which brings the total effect to 38%.



	Corruption	Integrity
Accountability	0.254	
Transparency	0.437	0.358

Table 8. The indirect effect of exogenous constructs

After evaluating the  $R^2$  value of all endogenous constructs, the next step is to assess whether predictor constructs have a substantive impact on endogenous constructs by calculating the effect size ( $f^2$ ) measure (Cohen 1988; Sarstedt et al. 2017), which essentially measures the change in the  $R^2$  value when a specific predictor construct is omitted from the model. The results show that Transparency has a large predictive effect on Accountability (0.98), a medium effect on Integrity (0.14), and no effect on Corruption (0.00). Results also show that Accountability has a large effect on Integrity (0.32), and no effect on Corruption (0.01), and Integrity has a medium effect on Corruption (0.17). These results are presented in Table 9.

	Accountability	Corruption	Integrity
Accountability		0.01	0.32
Integrity		0.17	
Transparency	0.98	0	0.14

Table 9. Effect size measure

Finally, the model's predictive accuracy and relevance are determined by calculating the cross-validated redundancy to determine the  $Q^2$  value (Geisser

1974; Stone 1974). The results of the blindfolding procedure show that  $Q^2$  values of all endogenous constructs are larger than zero, indicating that the path model's predictive accuracy is acceptable, as shown in Table 10 (Sarstedt et al. 2017).

	SSO	SSE	$Q^2 (=1-SSE/SSO)$
Accountability	17,492.00	12,081.07	0.31
Corruption	8,746.00	6,217.72	0.29
Integrity	21,865.00	14,817.47	0.32
Transparency	21,865.00	21,865.00	

Table 10. Results of blindfolding procedure

The results show that the model has good predictive accuracy. As shown previously in Table 7, except for the Transparency to Corruption path, all other paths in the model are statistically significant at the 0.001 level. The model also explains almost 40% of the variance in Corruption, 60% of the variance in Integrity, and almost 50% of the variance in Accountability (see Figure 8 above). Thus, except for hypothesis 4a, all of the proposed hypotheses are supported by the results.

Hypothesis 1 predicts that higher levels of transparency will be positively associated with greater accountability. The results presented in the figures and tables above support the hypothesis with a strong and significant relationship (0.704,  $p < 0.001$ ). This supports the view that access to information enables accountability, which ultimately curtails corruption. It was worth mentioning that in this scenario, the transparency indicators with the highest weights are effective

communication channels and the disclosure of rights and duties (0.431 and 0.3 respectively). The accountability factors with the highest weights are the accountability of managerial and financial rules violators and dealing with complaints effectively (0.356 and 0.364 respectively). Thus, confirming that having legitimate communication channels where complaints and suggestions are heard and actually dealt with is critical in combating corruption. This confirms why Transparency and Accountability come hand in hand in the literature, and why some studies go as far as portraying Accountability a function of Transparency or part of its definition (i.e. Rawlins 2009, Balkin 1999).

Hypotheses 2 and 3 predict that higher levels of transparency and accountability will be positively associated with higher levels of integrity. Again, the results support both hypotheses with a significant relationship (0.328 and 0.508 for H2 and H3 respectively,  $p < 0.001$ ). These results, along with the fact that the integrity indicator with the highest weight (0.356) is the encouragement and protection of whistleblowers, confirm that integrity is highly connected to the promotion of governance (Tsou and Wang 2008). Therefore, the results support the conclusion that the ability of transparency to reduce corruption by making corrupt acts risky and the agents accountable can ultimately maintain norms of integrity and trust (Kolstad and Wiig 2008).

Finally, hypotheses 4a, 4b, and 4c predict that higher levels of Transparency, Accountability, and Integrity are associated with lower levels of Corruption. The results of the model do not support the first hypothesis ( $p = 0.091$ ). Even though Transparency has an indirect effect of 44% on Corruption, the

insignificance of the direct path to Corruption along with the effect size ( $f^2$ ) measure of (0.00) illustrates that Transparency mitigates corruption through Accountability and Integrity and may be considered a less effective tool by itself.

Hypotheses 4b and 4c are both supported with a significant relationship ( $p < 0.001$ ). Specifically, Accountability has a weak effect on Corruption (13%) relative to Integrity's higher effect of 50%.

It is worth mentioning that the survey responses were also categorized according to demographics. Thus, assessing the responses with the demographics of respondents in mind may introduce some additional insights. For example, assessing corruption survey responses from the points of view men versus women introduces an interesting finding that is well supported in the literature. The women's responses for both questions had a lower mean than the men's responses (2.99 vs. 3.17 for the first indicator and 2.25 vs. 2.55 for the second indicator). This result shows that women are less tolerant of corruption activities than men, which corroborates a previous study that posits that women are more trustworthy and less prone to corruption than men (Dollar et al., 2001).

## **6. Conclusion**

Corruption has a negative effect on fairness, stability, and justice in any country (Sampford et al. 2006). It also plagues the highest levels of government and interferes with the state's primary functions; thus, structural solutions are required (Sandoval-Ballesteros 2014). No wonder that this topic has received

renewed interest and international attention in the past two decades from institutions like The World Bank and The International Monetary Fund (Peton and Belasen 2012), prompted the establishment of Transparency International, and the adoption of the United Nations Convention against Corruption (UNCAC) by almost all member states.

In his definition of corruption, Robert Klitgaard (1998) identified corruption as having monopoly control of public resources and officials having discretionary powers in the absence of accountability. The UNDP modified the definition by adding integrity and transparency to accountability.

This study measures the effect of three deterrents of corruption on corruption itself in a developing country setting. Then, the relationships among the deterrents are measured to understand the effect of transparency on accountability and the effect of both on integrity. The results show that not all deterrents have an equal effect on corruption. The analysis indicates that transparency is an important factor in the fight against corruption, but is not relevant by itself. It significantly affects corruption through facilitating accountability and ultimately integrity. The second important finding is that a strong and significant relationship exists among the three corruption deterrents. This result complements the first finding and demonstrates that transparency can encourage accountability and integrity if implemented correctly, thus reducing corruption.

Nonetheless, this study is not without limitations. Specifically, one inherent limitation should be considered in this scenario. Since this study deals with a developing country, reports and financial disclosures available to the public are

nonexistent. Thus, the data focuses on the internal workings of government agencies and employees' input. However, relying on a third party to acquire such data might provide more credibility due to the lack of motive for falsifying or managing the results.

Many opportunities exist to extend the results of this study. Constructs of higher order can be added to the model. Such additions may add more depth and understanding to the prerequisites and consequences of the proposed model. Also, since Kuwait is a developing country and is ranked relatively low in the corruption perception index, the direct effect (or lack of effect in this case) of transparency on corruption may be specific to countries or organizations with similar circumstances. Future research may study the same factors in a relatively higher-ranked country to test whether the effect of transparency on corruption is the same.

This research contributes to the literature by measuring the relationships among the three deterrents of corruption and assessing their effect on corruption in a unique setting. This has significant implications for all stakeholders. The strong and significant relationship between the three factors might encourage decision-makers to promote such initiatives. The heavily weighted indicators might serve as a good starting point for each factor. The results might also encourage the public and CSOs to demand higher levels of transparency and to introduce new instruments to analyze and make use of such data.

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## Appendix A

<b><u>Transparency</u></b>
<b>a. Agency's objectives are clearly stated and effectively communicated</b>
1. Objectives do not exist
5. Objectives are clearly stated and effectively communicated
<b>b. A procedure manual is documented, complied with, and updated (if necessary)</b>
1. Procedure manual does not exist
2. A procedure manual draft has been prepared
3. Procedure manual exists but isn't available to employees
4. Procedure manual exists, distributed to employees, and complied with
5. Procedure manual exists, distributed to employees, complied with, and is updated when needed
<b>c. A job description guide for all employees is documented</b>
1. Job description guide does not exist
2. A job description draft has been prepared
3. Job description guide exists but isn't available to employees
4. Job description guide exists, distributed to employees, and complied with
5. Job description guide, distributed to employees, complied with and is updated when needed
<b>d. Rights and duties are disclosed to employees</b>

1. Rights and duties are not disclosed
2. Sometimes some of the rights or duties are disclosed
3. Sometimes some of the rights and duties are disclosed
4. Rights and duties are disclosed
5. A certified mechanism for disclosure exists- orientation for new recruits- periodic meetings with employees, employees sign for receiving disclosure of rights and duties
<b>e. Effective communication channels between employees and executives are in place</b>
1. No employee meetings are organized
2. Meetings are only set when requested by the employee
3. Meetings are held sometimes without a prior appointment (for holidays and special occasions)
4. A specific day is organized for communicating with employees
5. A specific day is organized for communicating with employees/ a clear mechanism for dealing with suggestions and complaints exists, employees are exposed to any new project that may affect their work
<b><u>Accountability</u></b>
<b>a. Violators of managerial and financial rules are held accountable</b>
1. A system/mechanism for observing violators does not exist, and cases that were held accountable are rare
2. A system for observing violators exists but is not implemented, and cases that were held accountable are rare

3. A system for observing violators is implemented, and there are cases where employees were held accountable
4. A system for observing violators is implemented, and there are cases where employees and executives were held accountable
5. There are documents and reports that clearly confirm that the system is being implemented on everyone
<b>b. Internal control unit exists, works directly for the secretary or board of directors, and its recommendations are taken into consideration</b>
1. There is no internal control unit
2. Internal control system exists, but not as a separate unit (under the accounting department)
3. Internal control unit exists but works under the accounting/admin department and its recommendations are disregarded
4. Internal control unit exists but works under the assistant undersecretary
5. Internal control unit exists and works directly for the secretary
<b>c. Commitment to implementing rules and regulation, with regard to rules for hiring, promotions, and salary increase</b>
1. Does not exist
5. There is total commitment
<b>d. Complaints are effectively taken care of</b>
1. Does not exist
2. A system/mechanism does not exist, but it is customary to write a complaint and deliver it to direct manager

3. A system for complaints exist but is not documented in the policies, and complaints are not investigated seriously
4. A system exists, the employees were notified of it, but it doesn't guarantee the anonymity of the complainer (like the existence of a complaint box in a public area)
5. A system exists, the employees were notified of it, the anonymity of the complainer is guaranteed, and complaints are investigated seriously
<b><u>Integrity</u></b>
<b>a. Employees do not exploit public property for personal gain</b>
1. Work environment encourages employees to exploit public property... and there are cases that confirm that
5. The work environment is disciplined and there isn't any public property exploitation. Preventative sanctions exist for transgressors
<b>b. The agency prohibits employees from accepting gifts when conducting a service to the public. You are notified about this restriction. And it is acted upon</b>
1. Employees are not notified about the restriction
2. You heard about a restriction draft, but it was never communicated to the employees
3. Employees were notified orally
4. A restriction policy exists, and employees are notified about it
5. The policy exists and is acted upon

<b>c. The agency promotes ethics and integrity awareness and provides training to employees</b>
1. Does not promote awareness nor training
2. Limited awareness or training
3. Limited awareness and training for employees (one course annually)
4. Awareness and training (more than one annual course)
5. Awareness and training for most employees and leadership (more than 2 courses annually)
<b>d. Ethical standards are clear, disclosed, and implemented</b>
1. There are no agency-specific standards, and the civil service commission standards were not distributed
2. There are no agency-specific standards, but the civil service commission standards were distributed
3. A draft of the agency-specific standards exists, and the civil service commission standards were distributed
4. Agency-specific standards exist, distributed to employees, and is implemented (but not on executives)
5. Agency-specific standards exist, distributed to employees, and is implemented on ALL employees
<b>e. Encouragement and protection of whistleblowing</b>
1. No mechanism exists for whistleblowing, and whistleblowers may be harmed

2. No mechanism exists for whistleblowing, but whistleblowers will not be harmed
3. A whistleblowing mechanism exists but is not certified (not documented)
4. A certified whistleblowing mechanism exists, without documenting the anonymity or protection of the whistleblower
5. A clear certified whistleblowing mechanism exists, employees were notified of its existence, guarantees whistleblower anonymity, and carefully follows up on complaints
<b><u>Corruption</u></b>
<b>a. Financial violations</b>
1. Financial violations exist
5. Work ethic is positive and there are no financial violations
<b>b. Administrative violations</b>
1. Managerial violations exist
5. No managerial violations, regulations are respected

## Appendix B

شفافية
1 أهداف الجهة واضحة لديك، وتتواصل الإدارة بفاعلية معك لتحقيق أهداف الجهة.
2 يوجد دليل مكتوب بإجراءات العمل (هل هو في متناول اليد) ويتم التقيد به وتطويره عند اللزوم.
لا يوجد دليل
تم إعداد مسودة دليل
يوجد دليل معتمد ولكن ليس بمتناول يد الموظفين
يوجد دليل معتمد/ وموزع على الموظفين/يتم التقيد به
يوجد دليل معتمد/ وموزع على الموظفين/ويتم التقيد به/ ويتم تطويره عند اللزوم
3 يوجد دليل توصيف وظيفي لكل مستوى وظيفي.
لا يوجد دليل
تم إعداد مسودة دليل
يوجد دليل معتمد ولكن ليس بمتناول يد الموظفين
يوجد دليل معتمد/ وموزع على الموظفين/يتم التقيد به
يوجد دليل معتمد/ وموزع على الموظفين/ويتم التقيد به/ ويتم تطويره عند اللزوم
4 يتم تعريفك بحقوقك وواجباتك (عند التوظيف أو دائما أو أحيانا).
لا يتم التعريف بالحقوق والواجبات
أحيانا يتم التعريف ببعض الحقوق أو الواجبات
أحيانا يتم التعريف ببعض الحقوق والواجبات
يتم التعريف بالحقوق والواجبات
هناك آلية معتمدة يتم الالتزام بها لتعريف الموظفين بالحقوق والواجبات- لقاء توعوي للمعينين الجدد، لقاءات دورية مع الموظفين، توقيع الموظفين باستلام ما يشرح لهم حقوقهم وواجباتهم
5 توجد قنوات اتصال فاعلة لتوصيل آراء الموظفين للإدارة العليا (اقتراحات أو شكاوى). كما يتم إطلاع الموظفين على أية مشاريع جديدة تحدث تغييرا في عملهم.
لا يتم تنظيم لقاءات دورية ولا يتم اللقاء بالموظفين
يتم اللقاء فقط عندما يطلب الموظف
يتم اللقاء أحيانا ولكن دون تحديد يوم محدد، ومتروكه للأعياد والمناسبات
يتم تنظيم يوم محدد ثابت للتواصل مع الموظفين
يتم تحديد يوم محدد أو تنظيم فعالية للتواصل مع الموظفين / وهناك أليات واضحة للتعامل مع الشكاوى والاقتراحات (صندوق شكاوى/ وحدة معنية باستقبال الشكاوى)، ويتم إطلاع الموظفين على أية مشاريع جديدة تحدث تغييرا في عملهم.
مسائلة
1 يتم مساءلة ومحاسبة من يقوم بأية تجاوزات مالية وإدارية.
لا يوجد نظام أو آلية لرصد المتجاوزين، والحالات التي تم محاسبتها نادرة
توجد آلية لكنها غير مُطبقة، والحالات التي تم محاسبتها نادرة.

الآلية مُطبقة وهناك حالات من الموظفين تمت محاسبتهم
الآلية مُطبقة وهناك حالات من الموظفين والمسؤولين تمت محاسبتهم
توجد وثائق وتقارير تؤكد تطبيق الآلية على الجميع بشكل واضح
2) توجد وحدة إدارية للرقابة والتدقيق الداخلي، تتبع الإدارة العليا (الوزير أو مجلس الإدارة)، ويؤخذ بتوصياتها.
لا توجد وحدة متخصصة بالتدقيق الداخلي
يوجد نظام للتدقيق الداخلي ولكن لا توجد وحدة متخصصة لذلك (الشئون المالية).
توجد وحدة متخصصة للتدقيق الداخلي ولكنها تتبع الشئون المالية أو الإدارية.. ولا يؤخذ بتوصياتها.
توجد وحدة متخصصة للتدقيق الداخلي ولكنها تتبع الوكيل المساعد.
توجد وحدة متخصصة للتدقيق الداخلي ولكنها تتبع الوزير مباشرة.
3) يوجد التزام بجميع القوانين واللوائح المنظمة للعمل، وتشمل القوانين المنظمة للتعيينات، أو الترقيات، أو العلاوات، وغيرها.
لا يوجد
يوجد التزام بجميع القوانين واللوائح المنظمة للعمل، وتشمل القوانين المنظمة للتعيينات، أو الترقيات، أو العلاوات.
4) يوجد نظام فعال للنظر في شكاوى الموظفين.
لا يوجد
لا يوجد نظام لاستقبال شكاوى الموظفين ولكن تعارف على أن يكتب الموظف الشكاوى ويسلمها لمديره المباشر.
يوجد نظام لاستقبال الشكاوى ولكن غير موثق ضمن دليل السياسات، ولا ينظر للشكاوى بجدية
يوجد نظام لاستقبال الشكاوى وقد تم تعريف الموظفين به ولكنه لا يضمن السرية للشاكي (كوجود صندوق الشكاوى في مكان عام..)
يوجد نظام واضح لاستقبال الشكاوى، وقد تم تعريف الموظفين به، يضمن السرية للشاكي، ويتابع باهتمام موضوع الشكاوى
<b>نزاهة</b>
1) الموظفون لا يستغلون الممتلكات العامة لمصالحهم الشخصية.(استخدام سيارات جهة عملك، قرطاسية، أدوات ومعدات).
بيئة العمل تشجع الموظفين على استغلال الممتلكات العامة لمصالحهم الشخصية.. وهناك حالات تؤكد ذلك.
بيئة العمل منضبطة ولا يوجد أي استغلال للممتلكات العامة للمصالح الشخصية.. وهناك عقوبات رادعة للمتجاوزين.
2) تحظر الجهة على الموظفين قبول الهدايا لدى تقديم خدمة للجمهور، ويتم إعلامك بهذا الحظر.. كما يتم تفعيل هذا الحظر.
لا يتم اعلام الموظفين بحظر قبول الهدايا
سمعتم بوجود مسودة تعميم تحظر قبول الهدايا ولكن لم يتم التعميم
تم التعميم شفها على جميع الموظفين بحظر قبول الهدايا
تم صدور تعميم يحظر قبول الهدايا (أو تم إدراج ذلك ضمن دليل أخلاقيات المهنة)
وتم تعميمه على الموظفين
تم صدور تعميم يحظر قبول الهدايا وتم تعميمه وتطبيقه على الموظفين والمسؤولين



3) يتم توعية وتدريب الموظفين والإشرافيين والقياديين على قيم النزاهة وأخلاقيات المهنة.
لا يوجد توعية ولا تدريب على النزاهة
توجد توعية أو تدريب على النزاهة بشكل محدود
توجد توعية و تدريب على النزاهة بشكل محدود، و فقط للموظفين (دورة واحدة سنويا)
يتم التوعية والتدريب على قيم النزاهة (أكثر من دورة سنويا).
يتم تدريب معظم الموظفين والإشرافيين على قيم النزاهة (أكثر من دورتين سنويا).
4) وجد دليل معايير لأخلاقيات المهنة (مكتوب وموزع على الجميع)، ويتم الإفصاح عنه.. كما يتم العمل به.
لا يوجد دليل خاص للجهة، ولم يتم تعميم دليل ديوان الخدمة المدنية
لا يوجد دليل خاص للجهة، ولكن تم تعميم دليل ديوان الخدمة المدنية
يوجد مسودة دليل لأخلاقيات المهنة خاص بالجهة، وتم توزيع تعميم دليل ديوان الخدمة المدنية.
يوجد دليل معتمد خاص بالجهة / وموزع على الموظفين/ويطبق فقط على الموظفين دون المسؤولين
يوجد دليل معتمد/ وموزع على الموظفين/ويتم التقيد به / ويطبق على كل العاملين بالجهة بدءا أصغر موظف وحتى الوزير
5) يتم تشجيع الموظفين على الإبلاغ عن حالات الفساد من خلال التوعية وحماية المبلغ..(لا يتم الإضرار بالموظف إداريا او ماليا).
لا توجد آلية لاستقبال البلاغات عن حالات الفساد، وربما تضرر المبلغين.
لا توجد آلية لاستقبال البلاغات عن حالات الفساد، دون أن يتضرر أي من المبلغين.
<b>توجد آلية ولكن غير معتمدة (غير موثقة) للإبلاغ عن حالات الفساد</b>
توجد آلية معتمدة للإبلاغ عن حالات الفساد دون أن يتم النص على سرية التعامل أو حماية المبلغ.
توجد آلية معتمدة للإبلاغ عن حالات الفساد، تشمل بند ينص على سرية التعامل مع المبلغ وبند آخر ينص على عدم الإضرار بالشاكي أو المبلغ
<b>فساد</b>
1) الموظفون ليس لديهم تجاوزات مالية ( رشوة، أخذ مخصصات غير مستحقة، سرقة)
<b>توجد تجاوزات مالية</b>
<b>قيم العمل مفعلة ولا توجد أية تجاوزات مالية</b>
2) الموظفون ليس لديهم تجاوزات إدارية (الواسطة، خرق اللوائح، تجاوز للصلاحيات المقررة)
<b>توجد تجاوزات إدارية</b>
<b>لا توجد أية تجاوزات إدارية، وهناك احترام للوائح والأنظمة.</b>

## **Chapter 4**

# **Determinants of Internal Control Weaknesses in Information Technology, Software, Security, and Access**

### **1. Introduction**

Managers and internal auditors frequently overlook, misunderstand, and undervalue IT-related risks (Kumar 2002; Osmundson et al. 2003; Wallace et al. 2004). Unresolved, such risks may expose firms to various errors, potential fraud, or both.

It has been established that internal control weaknesses are generally associated with an increase in agency costs (Abdel-khalik 1993; Barefield et al. 1993; Morris 2011) and an increase in earnings management (Chang et al. 2008; Ashbaugh-Skaife et al. 2009). It has also been established that firms with internal control weaknesses specifically related to IT tend to have more non-IT weaknesses, more misstatements, lower return on assets, higher audit fees, and less accurate management earnings forecasts than firms with non-IT material weaknesses (Klamm and Watson 2009; Canada et al. 2009; Li et al. 2011). Even though ERPs improve the operation of their adopters and increased the

effectiveness of (most of) their internal controls, its positive effect on internal control weaknesses related to IT remains to be realized.<sup>4</sup>

ERP systems automate organizations' business processes. The system manages and carries out day-to-day transactions such as purchasing, manufacturing, sales, human resources management, and accounting. To improve their operations, companies replace their traditional application systems responsible for core business processes with the integrated structure of ERP systems (Debreceeny et al. 2005), which make ERP systems the most widely adopted IT system among large companies (Chang et al. 2014).

In addition to improving the operation of organizations, ERPs are also tasked with maintaining accurate and reliable data within the system, which is facilitated by adopting suitable controls for ERP systems. The effectiveness of these controls is critical in promoting the transparency of the company, which ultimately builds investors' confidence and ensures lower cost of capital (Ashbaugh-Skaife 2009; Chang et al. 2014).

Growth in ERP adoption increases the consideration of risks that are associated with IT and ultimately increases information system security and internal controls related to information systems (Dhillon 2007; Morris 2011; Stoel and Muhanna 2011; Walters 2007). The risks that are associated with the

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<sup>4</sup> The study by Morris (2011) shows that there is no significant difference between ERP and non-ERP weaknesses related to information technology, software, security, and access controls

implementation of ERPs are mostly related to its inability to eliminate all risks, its sophistication, which made it difficult to audit, and the absence of frameworks and guidance for auditing IT controls (Chang et al. 2014).

To maintain the effectiveness of internal controls, software vendors incorporate built-in controls within their ERP systems (Chang et al. 2014; Morris 2011), and ERP-adopting companies constantly audit the effectiveness of their system's internal controls by establishing an internal control framework in their ERP systems that allow both management and external auditors to assess their systems.

The advancement of controls within ERP systems and internal control frameworks has a positive and significant effect on the effectiveness of internal controls. Morris (2011) examines the impact of ERP systems on the effectiveness of internal controls over financial reporting and finds that ERP-implementing firms report significantly fewer internal control weaknesses than non-implementing firms. This finding suggests that firms that implement ERP systems are less likely to have internal control weaknesses, thus highlighting the importance of ERP systems.

However, ERPs do not improve all aspects of internal controls. The study by Morris (2011) categorizes the various internal control weaknesses into factors that affect two areas: general controls and specific (account-level) controls. The results of the study show that not all internal control weaknesses are significantly lower in ERP- implementing firms. One of the weaknesses in general controls that

has not witnessed an improvement with ERP implementation is information technology, software, security, and access controls (ICW-IT).<sup>5</sup>

This paper studies the occurrence of ICW-IT within ERP firms. The choice to look specifically at ERP firms is made for two main reasons. First, the use of ERP systems is prevalent among companies currently in operation, so focusing on ERP firms seems more relevant going forward. Second, given the built-in controls of ERP systems, it is important to know whether the ICW-IT that arise despite the presence of ERPs built-in controls reflect random problems or stem from the same systematic factors that the literature identifies in general internal control weaknesses.

The study uses a sample of 219 firms that announced the implementation of ERP systems and examines the relationship between the occurrence of an ICW-IT and various determinants of internal control weaknesses from the literature. The descriptive statistics show that firms with ICW-IT have more complex operations, have smaller audit firms, have more organizational changes, and are smaller in size. Moreover, the results of the regression indicate that the number of business segments is significant in explaining ICW-ITs, which confirms that multi-industry firms with diverse operations can build information aggregation issues resulting in substantial information asymmetries within the firm (Habib et al. 1997).

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<sup>5</sup> The study by Morris (2011) did not indicate any reason for the insignificance of this type of weakness.

Given the importance of differentiating between the different types of internal control weaknesses and the specific underlying deficiencies, the results in this paper may benefit auditors in their planning stage, rating agencies in their evaluation of creditworthiness, investors and analysts in their value determination, and management and audit committees in their investments in controls decisions (Klamm et al. 2012).

Moreover, ERP systems may contain large numbers of controls and logs that are working as intended. However, there may be underlying factors, such as their cost, maintenance, or knowledge required to operate them, that may be precluding internal auditors from using them.

The paper is organized as follows. Section 2 discusses the literature related to ERPs and ICW-ITs. Section presents the research methodology, and Section 3 discusses the results. Finally, Section 4 includes a discussion of the conclusions, limitations, and areas for further research.

## **2. Literature Review**

### *2.1 ERPs*

Numerous databases in organizations are being replaced by ERP systems that can integrate, analyze, and report information from all of the firm's business functions. The implementation of such systems force organizations to re-engineer their business processes in terms of structures and procedures (Kallinikos 2004). Although these advancements enhanced firms' operation and internal controls, they also introduced new risks.

The risks that accompanied the implementation of ERPs are rooted in three areas. First, ERP systems are not capable of eliminating all internal control risks. The built-in control features in ERPs may enhance the effectiveness of internal controls over financial reporting, but ERPs do not necessarily safeguard against deliberate system manipulations (Chang et al. 2014). For example, management can override some of the control features or choose to deactivate them in the implementation stage (Chang et al. 2014; Morris 2011).

Second, ERP systems are complex and thus challenging to audit. With the implementation of ERP systems, new challenges to the overall focus of internal audit functions have emerged (Hunton et al. 2001; Wright and Wright 2002; Saharia et al. 2008). O'Leary (2000) and Addison (2001) argue that this complex nature of ERP systems exposes organizations to significantly different risks like business interruption, change management, process interdependency, privacy and confidentiality, data content quality, and system security. Wright and Wright (2002) outline additional risks associated with ERP implementations like customization, process re-engineering, built-in controls, and incompatibilities with organizational requirements. Other studies have also found that ERP systems are risky from different perspectives (Scott and Vessey 2002; Aloini et al. 2007).

Since ERP systems are sophisticated and highly integrated, they have the potential to influence the internal audit function's structure and practices significantly (Avgerou 2001; Saharia et al. 2008). Furthermore, this development creates the need to acquire new knowledge and skills to understand the technicalities of an ERP system and the ability to audit it. Some studies find that

internal auditors have lost control of their traditional role in auditing ERP systems due to the transfer of their knowledge to information systems' staff (Spathis and Constantinides 2004). The AICPA (SAS No.94) recognizes the complexity associated with auditing ERP systems and indicated that auditors should consider assigning one or more computer assurance specialist (CAS) to provide further assistance. Despite the technical nature of ERP systems, internal auditors still rely on manual procedures and sample-based tests rather than employing more advanced automated techniques. This may not be surprising since Kim et al. (2009) find that, as technology features become more complex, internal auditors are less likely to use those features due to a decrease in their perceived ease of use.

Third, frameworks and guidance for auditing IT controls do not reflect the current business environment. With the specific intention of improving the quality of financial reporting, SOX Section 404 requires an annual evaluation of internal controls over financial reporting and the disclosure of material weaknesses in internal control. Furthermore, PCAOB Auditing Standard No. 2 (PCAOB 2004) requires auditors to determine whether firms are including information technology controls and to identify potential misstatements from information technology applications. Moreover, according to COSO's Enterprise Risk Framework, managers need to implement, evaluate, and report on controls over IT-based systems to help ensure continuous operations and the completeness, accuracy, and validity of information processing and storage (COSO 2004). Nonetheless, the report and framework brought forward by COSO fails to list supplemental criteria



in the implementation and assessment of IT controls, provide detailed control objectives that auditors require in the design of their tests, or address specific risks and complexities of IT (Chang et al. 2014; O'Donnell and Rechtman 2005; Colbert 1996). The absence of a capable framework for auditors coupled with minimal compliance guidance in the use of IT by regulators allows the interpretation of the scope and nature of the IT environment to be inconsistent (Chang et al. 2014; Brown and Nasuti 2005).

## *2.2 ICW-IT*

Even though some of the literature discussed in this section seems outdated, the reported outcomes may be relevant to the tests in this study.<sup>6</sup> Furthermore, the results of these studies may still hold true to this day. The vulnerabilities and risks that organizations face through potential system errors place the overall internal control system in jeopardy (Weidenmier and Ramamoorti 2006) and in turn, may increase the likelihood of misstatements (Messier et al. 2004). Furthermore, the pervasive nature of IT controls makes it much more difficult to correct for such errors rapidly, which accordingly decreases the likelihood of resolution between the time of discovery and the SOX 404 report issuance.

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<sup>6</sup> The tests include SOX 404 weaknesses from 2005.

A study by Walters (2007) states that several information system threats, such as unauthorized access and system vulnerability attacks, negatively influence the accuracy and reliability of financial data from the systems. Moreover, a survey study by Chang et al. (2014) shows that “access control of program and data” is the sole dimension that is unanimously recognized by all interviewees as an important criterion in information risk management, which also confirms the results of Wallace and Cefaratti (2011) that access control is the most common and highest priority control in practice.

Not all material weaknesses in internal controls have the same consequences on financial reporting quality (Grant et al. 2008). Relative to account-level weaknesses, weaknesses in general controls are more severe. Deficiencies in general controls are associated with lower accrual quality, auditor’s going concern assessments, and three-day market returns (Klamm et al. 2012; Doyle et al. 2007; Hammersley et al. 2008). Moreover, credit rating agencies like Moody’s reduce the rating of firms with weaknesses in general controls because they have greater scope, are more difficult to remedy, more likely to persist over time, and are difficult to compensate for by auditors (Klamm et al. 2012). Klamm et al. (2012) study the consequences of weaknesses in controls and state that deficiencies in IT-related general controls have the largest effect of all deficiencies. They find that firms reporting IT-related general controls weaknesses have 127% more future material weaknesses and take 56% longer to resolve than firms not reporting IT-related general control weaknesses.

### *2.3 Determinants of ICW-IT*

This paper identifies the relevant factors in ICW-IC by adopting variables that are previously used in the literature on effective/ineffective internal controls (Ge and McVay 2005; Klamm et al. 2012).<sup>7</sup> Prior research has studied the effect of firm size on internal controls. Numerous studies find that firm size is a significant determinant of effective internal controls (Kinney and McDaniel 1989; DeFond and Jiambalvo 1991). They generally reason that larger firms are more likely to have an adequate number of employees to ensure proper segregation of duties. Large firms also benefit from their economies of scale when it comes to developing and implementing internal control systems and have greater resources to spend on internal auditors or consulting fees, resulting in stronger internal controls.

The complexity of operations within firms is closely related to the size of the firm and is considered a determinant of internal control weaknesses. Reinganum (1985) states that larger firms are likely to be more complex and, in turn, require more complex management systems, attract higher skilled employees (Cooke 1989), and are subject to a greater demand for information (Goebel 2015; Biscotti and D'Amico 2016). The complexity of firm operation is usually associated with two factors: business diversification and geographic diversification. Bushman et al. (2004) suggest that both industry and geographic diversification impose significant

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<sup>7</sup> Since no determinants of weaknesses related to IT exist, papers that study IT with internal controls, like Klamm et al. (2012) or Morris (2011), usually use the same category of variables, such as operational complexity and size.

operational and informational complexity. Multi-industry firms with diverse operations can create information aggregation issues resulting in substantial information asymmetries within the firm (Habib et al. 1997). Firms with geographic diversification are in an environment that requires complex managerial decision-making skills (Bushman et al. 2004). Such firms must develop, coordinate, and maintain their organizational environment to face cultural and legal diversity across international markets, thus introducing a higher level of complexity (Davenport 1998). Furthermore, other complexities arise from dealing with multiple currencies, high auditing costs, differing legal systems, and cultural and language differences (Reeb et al. 1998; Duru and Reeb 2002; Denis et al. 2002). Prior literature has mostly adopted business segments as a measure for business complexity and the existence of a foreign currency adjustment as a measure for geographic diversification (DeFond et al. 2002; Bushman et al. 2004). This study does the same.

Another determinant of internal control weaknesses is organizational change, which is usually represented by mergers and acquisitions (M&A) and restructuring operations. Firms undergoing these operations usually engage in downsizing departments, laying off experienced workers, and general disorder during the restructuring phase, which may require an updated internal control system to deal with the changes (Doyle et al. 2007). Moreover, organizational change usually involves numerous accrual estimations and adjustments (Dechow and Ge 2006). When taken together, these two circumstances, more likely than not, will negatively affect the effectiveness of internal controls. Prior literature has

adopted two indicator variables to measure organizational change: restructuring costs and acquisitions (Morris 2011).

Finally, the size of the audit firm is widely used as an indicator of audit quality. Specifically, the Big-4 audit firms are consistently associated with relatively higher quality audits. The reason behind their superior quality is mainly due to their abundant resources and expertise in the business and the fees they charge. Prior literature uses an indicator variable to represent whether a firm has a Big-4 audit firm.

### 3. Methodology

In this study, the probability of disclosing an ICW-IT is modeled as a function of the factors discussed above by using a logistic regression. The dependent variable, ICW-IT, is an indicator variable that is equal to one if the firm disclosed an ICW-IT and zero otherwise. As in prior literature, the number of business segments in a firm and the existence of a foreign currency translation are used as measures of business complexity. The model also includes factors that are associated with internal control weaknesses in prior research, such as organizational change (mergers and acquisition, restructuring), size of the audit firm (Big4), and firm size (book value, market value):

$$\begin{aligned}
 IC\_IT = & \beta + \beta_1 FOREIGN + \beta_2 SEGMENTS + \beta_3 BIG4 + \beta_4 M\&A \\
 & + \beta_5 RESTRUCTURING + \beta_6 BOOK + \beta_7 MARKET
 \end{aligned}$$

Where **IC\_IT** is an indicator variable equal to one if the firm reports ICW-IT, **FOREIGN** is an indicator variable equal to one if the firm has a nonzero foreign currency translation, **SEGMENTS** is the number of business segments of the firm, **BIG4** is an indicator variable equal to one if the firm's auditor is one of the big four firms, **M&A** is an indicator variable equal to one if the firm reports a non-zero figure under acquisitions in the statement of cash flows, **RESTRUCTURING** is an indicator variable equal to one if the firm reports a non-zero figure in restructuring costs (any of the following: restructuring costs pretax, restructuring costs after-tax, restructuring costs basic EPS effect, or restructuring costs diluted EPS effect), **BOOK** is the book value of the firm, and finally **MARKET** is the market value of the firm.

### 3.1 Data

The data used in this study was collected from three sources. First, Seek iNF was used to search through SEC filings and identify firms that implemented ERP systems. Following the method used by Hayes et al. (2001) and Nicolaou (2004), this study employed a keyword search method using keyword search terms like "implement", "convert", and "contract" within proximity of the word ERP or any of the names of the top ERP vendors (e.g. SAP, Oracle, Qad). This process resulted in 219 distinct firms that implemented ERP systems.

The IDs of these firms were then used in Audit Analytics to retrieve information on firms that were issued SOX 404 weaknesses and identification of their auditor from 2010 through 2015. This process resulted in 704 observations.

The firm IDs were then used to retrieve firm information from the Compustat dataset. The data collected related to firms' foreign operation, mergers and acquisition, and restructuring for the years 2010 through 2015, resulting in 927 observations. The firm IDs were also used to collect data about their segments from another section in Compustat (Compustat - Segments), which resulted in 872 observations.

The datasets were merged (Compustat annual, Compustat - Segments, audit analytics) resulting in 612 observations. After dropping observations that had missing values, the final data set consists of 596 unique observations, as shown in Table 11.

<b>Data Sources</b>	<b>Observations</b>
<b>Audit Analytics</b>	704
<b>Compustat</b>	927
<b>Compustat - Segments</b>	872
<b>After merging</b>	<b>612</b>
<b>Dropped for missing variables</b>	-16
<b>Total</b>	<b>596</b>

*Table 11. Sample selection process*



#### 4. Results

Previous studies show that firms with relatively more complex operations are more likely to have material weaknesses (Ge and McVay 2005). The descriptive statistics in Table 12 show that the segments and foreign indicators of business operation complexity both have higher means for firms that disclosed ICW in IT, which supports results in the prior literature. The correlation matrix in Table 13 shows that both foreign and segments are positively correlated at 0.162 and the tests show that the correlation is significant ( $p < 0.01$ ), which indicates that a multicollinearity problem does not exist.<sup>8</sup>

Previous literature states that firm size is a determinant of good internal controls (Kinney and McDaniel 1989; DeFond and Jiambalvo 1991). This study uses book and market values as proxies for firm size. Looking at Table 12, it is evident that book and market both have lower means for firms that reported ICW in IT, which supports the findings in prior literature. The correlation matrix in Table 13 shows that the correlation between book and market values is significant and positively correlated at 0.795, which indicates that a multicollinearity problem may be present between the two. However, additional diagnostic tests using variance inflation factors (VIF) confirm that none of the independent variables has significant multicollinearity (all VIF values are below 3.0).

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<sup>8</sup> No significant multicollinearity exists if the  $r$  value is less than 0.50 (Morris 2011)

Then, the role of auditors in identifying and reporting material weaknesses in internal control is examined. As previously stated, large audit firms might encounter fewer internal control problems due to the size of their clients and the expectation that they have greater auditing expertise and exposure to legal liability (Ge and McVay 2005). This study uses the Big-4 firms as proxies for large firms. Table 12 shows that firms with no ICW-IT have a slightly higher mean in the size of their auditor. The correlation matrix in Table 13 shows that the Big4 variable has a negative relationship of -0.043 with IT\_IC. Additional tests also show that the Big4 variable has a significant correlation with the firm size variables, which supports previous studies and explains its relationship with IT\_IC.

Finally, organizational change variables, which are represented by M&A and restructuring, are examined. Although not statistically significant, the descriptive statistics in Table 12 show that both variables are slightly higher for firms with ICW-IT, which suggests that firms going through organizational changes are more susceptible to ICW-IT. Both variables are positively correlated with ICW-IT and are not significantly correlated with each other. Thus, the descriptive statistics provide an initial understanding of the determinants of ICW-IT.

	IT_IC = 1			
<b>Variables</b>	<b>Mean</b>	<b>Std Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Segments</b>	2.91	1.57	1.00	6.00
<b>Foreign</b>	0.59	0.50	0.00	1.00
<b>Big4</b>	0.68	0.48	0.00	1.00
<b>M&amp;A</b>	0.50	0.51	0.00	1.00
<b>Restructuring</b>	0.55	0.51	0.00	1.00
<b>Book</b>	257.78	264.21	-170.90	1140.72
<b>Market</b>	652.58	526.59	50.00	1806.80

Table 12. Descriptive Statistics for IT\_IC = 1

	IT_IC = 0				
<b>Variables</b>	<b>Mean</b>	<b>Std Dev.</b>	<b>Min</b>	<b>Max</b>	<b>Difference (p-value)</b>
<b>Segments</b>	2.47	1.54	1.00	8.00	Diff < 0 (0.094)
<b>Foreign</b>	0.47	0.50	0.00	1.00	Diff < 0 (0.130)
<b>Big4</b>	0.78	0.42	0.00	1.00	Diff > 0 (0.148)
<b>M&amp;A</b>	0.43	0.49	0.00	1.00	Diff < 0 (0.243)
<b>Restructuring</b>	0.43	0.50	0.00	1.00	Diff < 0 (0.139)
<b>Book</b>	1275.38	3287.10	-600.28	22414.85	Diff > 0 (0.073)
<b>Market</b>	3642.66	11697.05	0.94	136476.90	Diff > 0 (0.115)

Table 13. Descriptive Statistics for IT\_IC = 0 and Difference Between the Two Samples

<b>Correlation Matrix (Significance)</b>								
	<b>IT_IC</b>	<b>Foreign</b>	<b>Segments</b>	<b>Big4</b>	<b>M&amp;A</b>	<b>Restr.</b>	<b>Book</b>	<b>Market</b>
<b>IT_IC</b>	1.000							
<b>Foreign</b>	0.046 (0.260)	1.000						
<b>Segments</b>	0.054 (0.188)	0.162 (0.000)	1.000					
<b>Big4</b>	-0.043 (0.296)	-0.105 (0.010)	0.001 (0.976)	1.000				
<b>M&amp;A</b>	0.029 (0.486)	0.036 (0.376)	0.001 (0.985)	-0.026 (0.522)	1.000			
<b>Restr.</b>	0.045 (0.278)	0.162 (0.000)	0.035 (0.394)	0.101 (0.014)	0.018 (0.662)	1.000		
<b>Book</b>	-0.059 (0.147)	0.089 (0.030)	0.150 (0.000)	0.169 (0.000)	0.098 (0.017)	0.079 (0.054)	1.000	
<b>Market</b>	-0.049 (0.231)	0.021 (0.615)	0.102 (0.012)	0.150 (0.000)	0.091 (0.026)	0.056 (0.172)	0.795 (0.000)	1.000

Table 14. Correlation Matrix

Finally, the model was used to run a regression with all available measures. The results of the regression are presented in Table 15 below. Measures of operation complexity, foreign and segments, both have a positive effect on ICW-IT, albeit only segments seem to be significant. This finding is important because Morris (2011), which tested the number of material weaknesses between ERP and non-ERP adopters, finds segments to be non-significant. This difference in results

indicates that complexity of operations has an isolated effect on ICW-IT. The remaining factors all have a positive effect on the dependent variables, though without significance, which suggests that a systematic problem does not exist within ERP firms.

<b>Independent Variables</b>	<b>VIF</b>
Book	2.82
Market	2.74
Foreign	1.08
Big4	1.06
Segments	1.05
Restructuring	1.04
M&A	1.01

*Table 15. Multicollinearity Test results*

Logistic Regression of the Probability of a Firm Disclosing an ICW in IT			
	Dependent Variable = IT_IC		
Independent Variables	Estimate	Std. Error	p-value
Intercept	-4.162	0.807	0.000
Foreign	0.442	0.490	0.366
Segments	0.295	0.130	0.023
Big4	0.054	0.511	0.916
Ma	0.670	0.463	0.148
Restr.	0.681	0.501	0.174
Market	-0.000	0.000	0.271
Book	-0.002	0.001	0.131
<p><b>IC_IT</b> is an indicator variable equal to one if the firm disclosed internal control weaknesses related to IT and zero otherwise.</p>			
$IC\_IT = \beta + \beta_1FOREIGN + \beta_2SEGMENTS + \beta_3BIG4 + \beta_4M\&A$ $+ \beta_5RESTRUCTURING + \beta_6BOOK + \beta_7MARKET$			

Table 16 Logistic Regression Results

#### *4.1 Additional Test*

Even though no significant multicollinearity problems were indicated, as shown in Table 14, additional tests of the model were conducted to assess the results without one of the two highly correlated variables (book and market values). The results of the logistic regression after eliminating the market variable did not drastically change the previous results. Nonetheless, the omission of market variable changes the significance of the book firm size indicator. Table 16 below shows that the independent variable Book has a significant effect on the occurrence of ICW-IT.



<b>Logistic Regression of the Probability of a Firm Disclosing an ICW in IT</b>  <b>(Without Market)</b>			
	<b>Dependent Variable = IT_IC</b>		
<b>Independent Variables</b>	<b>Estimate</b>	<b>Std. Error</b>	<b>p-value</b>
<b>Intercept</b>	-4.062	0.754	0.000
<b>Foreign</b>	0.429	0.486	0.377
<b>Segments</b>	0.271	0.119	0.023
<b>Big4</b>	0.049	0.486	0.919
<b>Ma</b>	0.660	0.466	0.157
<b>Restr.</b>	0.671	0.499	0.177
<b>Book</b>	-0.002	0.001	0.019
<p><b>IC_IT</b> is an indicator variable equal to one if the firm disclosed internal control weaknesses related to IT and zero otherwise.</p>			
$IC\_IT = \beta + \beta_1FOREIGN + \beta_2SEGMENTS + \beta_3BIG4 + \beta_4M\&A$ $+ \beta_5RESTRUCTURING + \beta_6BOOK$			

Table 17 Logistic Regression Results Without the Market Variable

## 5. Conclusion

ERP systems improve the operation and data management of organizations. Thus, they are considered a necessity for many firms. ERP systems also strengthened the internal controls of organizations, and it has been shown that ERP-adopters report fewer material weaknesses in internal controls. However, not all internal control weaknesses are reduced by ERP systems. Results of previous studies show that internal control weaknesses related to information technology, software, security, and access do not significantly change after ERP adoption.<sup>9</sup>

Due to the importance of both ERPs and ICW-IT, this study analyzes the SOX 404 and financial disclosures of ERP-adopters to find the determinants of ICW-IT. This is achieved by collecting data from Compustat, Audit Analytics, and SeekiNF. A model is proposed that uses an indicator dependent variable for ICW-IT occurrence and seven independent variables. The variables consist of operation complexity, auditor size, firm size, and organizational changes. Then, the relationship between the variables is statistically analyzed via a regression model. The statistical results show that, on average, firms with ICW-IT are more complex, have smaller audit firms, have more organizational changes, and are smaller in size. However, the regression model shows that segments is the only significant

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<sup>9</sup> The general (entity-wide) factors that do change after ERP implementation are: (1) Accounting documentation, policy and/or procedure, (2) Accounting personnel resources, compet./training, (3) Material and/or numerous auditor/YE adjustments (see Morris 2011, p. 148).

variable in the model, which suggests that the occurrence of ICW-IT in ERP-implementers is probably random.

The insignificance of most variables in the study is a limitation of the study. An alternative explanation for the random causes of ICW-IT might be the relatively low occurrences of this specific weakness. Future research may mitigate this problem by accumulating more data points for ICW-IT. Furthermore, future research may complement this study by analyzing the effect of ICW-IT on the quality of internal audits and fraud.

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## **Chapter 5**

### **Conclusion**

Financial accounting information affect economic performance directly and indirectly through project identification, governance, and adverse selection. Nonetheless, there are some factors that strengthen or weaken the effect of financial information through these channels, namely: the auditing regime, political influence, control mechanisms, communication infrastructure, financial analysts, and the legal environment. This dissertation focuses on three of these important factors (auditing regime, political influence, and control mechanisms).

The first essay focuses on the auditing regime. It is reasonable to expect that benefits of financial disclosures increase with the rigor of audit performance. The reason behind that may be the relatively lower probability that managers will distorted accounting numbers. Moreover, rigorous audits provide better information for identifying investments, disciplining managers, and reducing adverse selection. Thus, higher quality accounting information increases the reliance of economic agents on financial reporting. Even though CA tools provide a faster and higher level of assurance relative to traditional audits, audit teams seem to avoid relying on them in their audits. A literature review on reliance allows for the construction of a reliance framework. First, factors that affect reliance are categorized as direct or indirect. The second level of categorization is based on the party involved. For example, factors that have a direct effect on reliance are categorized into firm, task, and tool. Firm is comprised of factors that are related

to the individual auditor like confidence and experience and factors that are related to the audit firm environment like risks, costs, and pressure. Task is mainly concerned with factors that are related to the complexity of the task. Tool is comprised of factors that explain the features and cognitive fit of the tool. Factors that have an indirect effect on reliance are categorized into auditees and regulators. The former is concerned with privacy concerns and demand for CA, whereas the latter is concerned with guidance and support for reliance on such tools. The essay then presents two cases that highlight some of the factors presented in the framework and discusses ways to move forward. Specifically, two case studies highlight how the risks and pressures involved in conducting audits negatively affect reliance on CA. They also highlight the complexity of the tasks required and the features of the tool that may also play a part in negatively affecting auditors' reliance. Finally, the cases show that even though the auditees gave complete access to their CA tool and requested its use, their previous years' weaknesses in internal controls coupled with the lack of standards/guidance for the use of CA ultimately discouraged the auditors from relying on the tools.

The second essay discusses another area that may influence the economic effect of financial information: political influence. The ability and propensity of politicians to expropriate wealth negatively affects the efficiency effects of accounting information of a certain quality. The reasoning behind that is the increased costs of entry into a market that is associated with weaker political rights, fewer constraints on the power of top government officials, and higher corruption. Corruption is identified as having monopoly control of public resources and officials

having discretionary powers in the absence of transparency, accountability, and integrity. The study utilizes a data set that was obtained from Transparency International – Kuwait to measure the effect of three corruption deterrents (transparency, accountability, and integrity) on corruption itself and the relationship among the three deterrents in a developing country. The results of the analysis show that the three deterrents have different effects on corruption. Specifically, the results show that, even though transparency is an important factor in combating corruption, it is not significant by itself. Transparency only significantly affects corruption through accountability and integrity. Further analysis of the relationship among the three deterrents illustrates the existing significant relationship among them, which complements the first finding in demonstrating that transparency positively affects accountability and integrity and ultimately curtails corruption if implemented correctly.

The final essay is concerned with control mechanisms. It is argued in the previous literature that powerful control mechanisms in an organization are associated with an increase in the economic benefits of financial information. It is believed that a positive interaction between the quality of the financial accounting regime and the quality of control mechanisms create additional support for the governance role of financial accounting information. An example of a technology that positively affects control mechanisms is ERPs. Not only do ERP systems improve the operation and data management of organizations, but they also played a role in significantly strengthening internal controls. Nonetheless, a review of the ERP literature finds that ERP systems do not manage to reduce all types of internal

control weaknesses. Specifically, internal control weaknesses related to information technology, software, security, and access do not significantly change after the ERP implementation. The importance of ERPs and ICW-IT motivated this study to analyze SOX 404 and various financial disclosures to identify the determinants of ICW-IT within ERP-adopters. After collecting data from Compustat, Audit Analytics, and SeekiNF, a model is proposed. The model has an indicator dependent variable for ICW-IT occurrence and seven independent variables: operation complexity, auditor size, firm size, and organizational changes. The statistical results show that firms with ICW-IT are more complex, have smaller audit firms, have more organizational changes, and are smaller in size. The regression model shows that the number of segments is a significant variable in determining ICW-IT within ERP adopters.