The impacts of the use of data analytics and the performance of consulting activities on perceived internal audit quality

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Abstract

Purpose

This research investigates the effects of the internal auditor use of data analytics and the performance of consulting activities on perceived internal audit quality.

Design/methodology/approach

We conducted a 2x2 between-subjects experiment among upper and middle managers where the use of data analytics and the performance of consulting activities by internal auditors were manipulated.

Findings

Results indicate that managers perceive internal auditors as more competent when they use data analytics and that managers perceive that the quality of their relationship with internal auditors is higher when internal auditors perform consulting activities. They also perceive that internal auditors' recommendations are more relevant when they perform consulting activities. In addition, findings show an interaction effect where the use of data analytics with the performance of consulting activities strengthens the perceived quality of the relationship between internal auditors and management.

Research limitations/implications

From a theoretical perspective, this research builds on the internal audit quality framework by considering digitalization as a contextual factor. This research focused on one major stakeholder of the internal audit function: senior management. Future research can investigate the perceptions of other stakeholders.

Practical implications

From a managerial perspective, the implications of this research indicate that internal auditors should prioritize the development of the consulting role in their function and develop their digital expertise, especially regarding data analytics.

Originality

This research tests the impacts of the use of data analytics and the performance of consulting activities on perceived internal audit quality holistically, by testing Trotman and Duncan (2018)'s framework through an experiment.

Introduction

The trend towards digitalization has permeated all industries (Verhoef *et al.*, 2021). Digital transformation not only affects corporate processes, operational activities, and customer interactions; it can also alter entire industries. The emergence of 'born digital' companies that are agile enough to meet changing demands and grab customers away from less agile companies has added complexity to today's business environment (Protiviti, 2019a). Digitalization is described as the changing of a business model through the use of digital technologies to provide new, value-producing opportunities (Christ *et al.*, 2019). Over the past decade, digital risks have emerged and changed at an exponential pace, compelling organizations to adapt in order to survive in an increasingly complex environment. (IIA, 2019).

Digitalization trends have grabbed the attention of management, boards, and regulators (ECIIA, 2019, Kane *et al.*, 2016). Board members and top management identify performance expectation shortfalls and competing with 'born digital' organizations as top risks in a recent survey (Protiviti and North Carolina State University, 2019). Another survey (ECIIA, 2019) notes that 2 out of 3 internal audit functions (IAFs) will undertake digital transformation initiatives. Moreover, these IAFs are at the forefront of digitalization.

Digitalization provides an important opportunity for IAFs as they work to remain relevant by adding value to organizations, as perceptions of internal audit quality amongst stakeholders vary considerably. Trotman and Duncan (2018) find that context influences stakeholders' judgments of the internal audit quality. In addition, they call for research on the impact of the nature of the engagement (consulting and assurance) on specific quality dimensions in stakeholders' perceptions. This paper extends the work of Trotman and Duncan (2018) by considering the impact of digitalization as contextual factor, specifically the IAF's use of data analytics[1] as well as the impact of the nature of the internal audit engagement on perceived internal audit quality from the viewpoint of management. This study uses a 2 (presence versus absence of data analytics) x 2 (presence versus absence of consulting activities) between-subjects experimental design.

The authors posit that IAFs are uniquely positioned to identify, understand, and help organizations manage the risks and opportunities that arise from digitalization; activities that

[1] In this paper, data analytics is considered an application of digitalization inside organizations.

demonstrate both the relevance of and the value added by the IAF. IAFs have an enterprise-wide perspective, apply a risk-management approach, and continuously search for, remediate and control weaknesses while also identifying efficiency opportunities (Protiviti, 2019a). Thus, IAFs are able to simultaneously observe and analyse the organization's digital landscape from both a strategic and an audit and control perspective. The use of data analytics helps IAFs innovate, improves decision-making, and increases agility in the face of digital disruptions (IIA, 2018). Data analytics also enables continuous auditing in areas such as compliance and financial controls, freeing IAF time to focus on high-risk and value-added areas such as cybersecurity and strategic risk (ECIIA, 2019). Shifting to more value-added activities with a focus on risk is consistent with the Institute of Internal Auditors' (IIA, 2019) recommendation that IAFs utilize data analytics to identify and monitor precursors to risks. Thus, our study is timely as significant variability remains in IAF capabilities and use of data analytics.

Theoretical background

Internal audit quality framework

Providing value to organizations is essential for the IAF to remain relevant (Garven and Scarlata, 2020; Stewart and Subramaniam, 2010; Castanheira *et al.*, 2010; Soh and Martinov-Bennie, 2011). As a non-mandated function in most contexts, internal auditors cannot afford a narrow focus based only on evaluating and strengthening internal controls (Brody and Lowe, 2000; Cashell and Aldhizer, 2002; Cohen *et al.*, 2004; EY and Forbes, 2017; Erasmus and Coetze, 2018; Gramling *et al.*, 2004). The IIA's definition of internal auditing stresses that IAFs provide consulting services in addition to more traditional assurance services, a practice that has existed in leading IAFs for many years (Garven and Scarlata, 2020; Nagy and Cenker, 2002). These consulting services, which often include serving an advisory role in new system implementation projects, are typically seen as value-added (Betti and Sarens 2020; Betti *et al.*, 2021).

The ability of the IAF to add value to the organization is an important dimension of the broader multi-dimensional concept of internal audit quality (Trotman and Duncan, 2018). In this perspective, various groups of stakeholders assess internal audit quality differently. Trotman and Duncan (2018) developed a multi-stakeholder internal audit quality framework based on the external audit quality frameworks of Knechel *et al.* (2013) and IAASB (2014). Based on Trotman and Duncan's model, internal audit quality assessment contains four dimensions:

- The input: the internal auditor's skills, expertise, objectivity, soft skills, and personality traits.
- The process: technical audit production and service interaction[2].
- The output: the IAF's ability to produce good reports.
- The outcome: the ability of the IAF to create value.

However, the IAF's major stakeholders, including in-house/co-sourced/outsourced internal auditors, the audit committee, senior management and external auditors, do not utilize a common method to assess the internal audit quality and tend to attribute emphasis differently to each dimension (Trotman and Duncan, 2018). For example, external auditors focus most on the input dimension, specifically the extent to which the IAF is objective[3], while senior management focuses on the ability of the IAF to create value for the organization (the outcome dimension). In-house internal auditors tend to consider their IAF as high quality when everything possible is done in relation to the internal audit process dimension to ensure a complete audit engagement, which is operationalized by the process dimension of the internal audit quality framework.

Trotman and Duncan's (2018) internal audit quality framework stresses that contextual factors such as tone at the top, access to appropriate staff, and use of the IAF as a management training ground impact the four dimensions of internal audit quality. However, their framework doesn't investigate digitalization as a contextual factor. Given the importance and the effects of increasing digitalization on organizations, this research extends Trotman and Duncan's (2018) work by investigating the impact of digitalization as a contextual factor which affects internal audit quality. Specifically, this research project examines the role of a popular and expanding technology: data analytics (Betti and Sarens, 2020; Betti *et al*., 2021; Koreff *et al*., 2021; Krieger *et al*., 2021; Rakipi *et al*., 2021). Figure 1 presents the internal audit quality framework developed by Trotman and Duncan (2018), adding digitalization and the data analytics factors investigated by this paper.

[2]The technical audit production indicators are the methodology employed within the audit, auditing in alignment with the organizational perspective, and the audit approach. Under the service interaction area, the two quality indicators are strong relationships among stakeholders and the engagement closeout procedures.

[3] Following the IIA's (2017, p. 3) definition, we consider an IAF as independent if it is 'free from conditions that threaten the ability of the internal audit activity to carry out internal audit responsibilities in an unbiased manner'. An IAF and its members are objective if they possess an 'unbiased mental attitude that allows them to perform engagements in such a manner that they believe in their work product and that no quality compromises are made' (IIA, 2017, p. 4).

[INSERT Figure 1: Multi-stakeholder internal audit quality framework and digitalization]

Digitalization as an additional contextual factor

Digitalization describes the adoption and use of digital technologies in organizational, societal and individual contexts (Legner *et al.*, 2017). More specifically, Verhoef *et al.* (2021, p. 891) define it as the way 'IT or digital technologies can be used to alter existing business processes'. Internal auditors still struggle to integrate digital technologies into their work (PwC, 2019). For instance, 54% of internal auditors do not plan to use artificial intelligence within the coming years and 49% do not plan to use robotic process automation. Nevertheless, many IAFs have integrated data analytics into their work, especially in audit planning and execution (PwC, 2019). In a 2018 IIA survey, approximately 60% of chief audit executives stated that their IAFs had fully or partially implemented data analytics in some manner (IIA, 2018). However, in 2019, only 3 in 10 chief audit executives reported completely harnessing the full potential of data analytics (IIA, 2019). Therefore, despite multiple stakeholders believing in the value of data analytics, there are mixed findings regarding the actual use of data analytics by IAFs.

Data analytics can help IAFs bring more value to organizations and allow greater IAF alignment with the business (Betti and Sarens, 2020; Betti *et al.*, 2021; PwC, 2018). In 2018, worldwide digital data represented 33 zettabytes (3 trillion gigabytes) and today, it continues to grow rapidly (IDC, 2018). Given this volume of data, coupled with the velocity of data collection and availability, data analytics can be a powerful tool to integrate and manage the variety of structured and unstructured data from both internal and external sources, enabling internal auditors to provide important insights to decision makers. The American Institute of Certified Public Accountants defines data analytics as 'the science and art of discovering and analyzing patterns, identifying anomalies, and extracting other useful information in data underlying or related to the subject matter of an audit through analysis, modeling, and visualization of planning or performing the audit' (AICPA, 2017, p. 1). Data analytics enables both advanced analyses of past events and predictive analyses of future events (i.e. through simulations or clustering) (Al-Htaybat and von Alberti-Alhtaybat, 2017; Lee *et al.*, 2014; Mariani and Wamba, 2020; Rickett, 2016; Tschakert *et al.*, 2016). In this sense, data analytics may be used during different points of the internal audit process: in the planning, execution, and/or follow-up phases (Tang *et al.*, 2017; Wang and Cuthbertson, 2015). Performing analyses on all available data could help the IAF to make more precise assessments, plan better testing to meet audit objectives, and provide insights about future events. It also helps the IAF to provide

management with proactive advisory and consulting services regarding the identification of emerging risks (PwC, 2018).

Prior literature highlights the importance for the IAF to perform consulting and advisory activities to assist the organization in proactively dealing with risk and improving business efficiency (Betti and Sarens, 2020; Soh and Martinov-Bennie, 2011). Given the pervasive impact of digital technologies on society, the IAF can position itself as a digital change agent in order to help with monitoring emerging risks (i.e. cyber security) and also to bring value to organizations (Betti and Sarens, 2020; Stewart and Subramaniam, 2010; Castanheira *et al.*, 2010; Soh and Martinov-Bennie, 2011; Chapman, 2001). Research suggests that senior management desires more support and guidance from the IAF on digital matters, such as IT governance processes and IT security issues (D'Onza *et al.*, 2015; Roussy, 2013). For instance, internal auditors could advise senior management on cybersecurity programs and risk prevention (Dixon and Singer, 2011; Kahyaoglu and Caliyurt, 2018) and provide guidance in the implementation of new technologies (Flora and Rai, 2015). The value of data analytics results when internal auditors ask the right questions and make insightful recommendations (Betti and Sarens, 2020). Therefore, auditors performing consulting activities, who develop more knowledge of the business, are be in a better position to appropriately use data analytics.

However, we still have limited knowledge about how consulting activities and data analytics affect the perceived internal audit quality (Roussy and Perron, 2018). In this paper we test whether the use of data analytics and the performance of consulting activities can alter the perception of internal audit quality.

Hypotheses

Perceptions of internal audit quality differ between stakeholders as they have diverse needs and views (Cohen *et al.*, 2004; Cohen *et al.*, 2013; Erasmus and Coetze, 2018; IAASB 2014; Trotman and Duncan, 2018). Until recently, internal audit quality research focused almost solely on competence, objectivity, and work performance (Bame-Aldred *et al.*, 2013; Gramling *et al.*, 2004; Lesage and Ben Saab, 2009; Prat Dit Hauret, 2003). Roussy and Brivot (2016) found that stakeholder perceptions of internal audit quality are more complex than what is suggested in the literature, and Trotman and Duncan (2018) built on that research to develop the aforementioned multi-stakeholder model of internal audit quality. Trotman and Duncan (2018) found that stakeholders consider technical skills to be the foundation for a high-quality

IAF. While in their study participants indicate that IAFs generally possess the necessary technical skills, and despite recent research that investigates the use of data analytics by IAFs[4], Trotman and Duncan (2018) did not specifically consider digitalization and the use of data analytics. In contrast, more than 50% of surveyed chief audit executives indicated that data mining and analytics are essential for an IAF to properly discharge its duties (IIA, 2018). According to chief audit executives who were surveyed regarding the use of enabling technologies, data analytics is used with the greatest frequency and IAFs derive the highest relative value therein (Protiviti, 2019b). However, even when utilized, data analytics is typically incorporated by IAFs as a point solution rather than as part of a broader initiative (Protiviti, 2018).

The use of data analytics requires that an IAF possesses technical skills (input measure within the internal audit quality framework). Trotman and Duncan (2018) also identify technical production (process measure within the internal audit quality framework) as a main indicator of quality within IAF processes. Their interviewees noted the value of and, therefore, preference for a risk-based strategic audit approach over a compliance-based 'tick-and-flick' audit approach, as risk-based auditing allows IAFs to identify organizations' biggest risks while balancing time and resources effectively (Christ *et al.*, 2019; ECIIA, 2019). Data analytics enables a more efficient risk-based approach by allowing IAFs to perform risk profiling, test data simulation, and perform statistical sampling during the planning stages of the audit (Protiviti, 2018). Also, data analytics enable IAFs to perform full population testing, continuous controls monitoring, fraud indicator assessment, predictive risk identification, and control simulation during the audit execution stage (Christ *et al.*, 2019; ECIIA, 2019; Protiviti, 2018). Furthermore, the use of data analytics for auditing compliance and financial controls can free up internal audit's time to focus on high-risk areas such as cybersecurity or strategic risks (ECIIA, 2019). Board members and top management recognize the value of data analytics as they view their use as a key element of managing operations and strategic risks (Protiviti and North Carolina State University, 2019). Internal auditors possess a unique view of the organization from both a risk and strategic perspective. Thus, internal auditors that are both engaged in consulting activities as a trusted advisor to management, and are able to use the

[4] Fewer than one third of chief audit executives surveyed reported that their groups extensively used the simplest data analytics techniques (IIA, 2018). 63% of IAFs surveyed used data analytics as part of the audit process (Protiviti, 2018).

power of data analytics to analyze large data sets, can increase their value-add in the eyes of management.

Data analytics may also improve the quality of IAF reporting (output measure within the internal audit quality framework) by allowing for risk quantification, real-time exception management and root-cause investigation (Protiviti, 2018). As reports including these elements are more useful for stakeholders, IAFs should therefore be viewed as value-adding (outcome measure within the internal audit quality framework). When combined, the preceding suggests that the use of data analytics by IAFs will increase perceived internal audit quality from all stakeholder perspectives across all four dimensions of internal audit quality. Prior research in external auditing indicates that the use of digital technologies and data analytics may increase the quality of the external audit engagements by analysing full data sets instead of limiting the testing to samples (Earley, 2015; Manita *et al.*, 2020).

However, prior research also finds that IAF use of data analytics creates challenges, including stakeholder frustration caused by insufficient time to perform other types of audits and increased staff turnover as analytics-savvy internal auditors are poached internally for management positions or by other companies. This may lead to client frustration and a decrease in perceived internal audit quality (Christ *et al.*, 2019). If internal auditors lack data analytics proficiency, they are less likely to ask the correct questions and use the correct analyses, and may instead investigate the wrong things. This would result in less relevant recommendations; and, would ultimately result in a decrease in perceived internal audit quality from a manager's perspective.

Despite these challenges, we argue that while IAF use of data analysis is still in development, its potential benefits outweigh its drawbacks. Thus, we pose our first hypothesis:

> *H1: Perceived internal audit quality will be higher when internal auditors use data analytics than when internal auditors do not use data analytics.*

Since the IIA added consulting activities to the definition of internal audit in 2000 (Rittenberg and Covaleski, 2001), many concerns have been voiced about the effect on auditor objectivity (i.e. Lenz and Hahn, 2015; Roussy, 2013; Soh and Martinov-Bennie, 2011). However, Trotman and Duncan (2018) found that stakeholders consider objectivity to be a mindset. This contrasts with previous research which used proxies for objectivity via an IAF's organizational

independence (Prawitt *et al.*, 2012; Ege, 2015; Lin *et al.*, 2011). The mindset viewpoint is consistent with objectivity as defined in IIA audit standards and suggests added value when IAFs work closely and have strong relationships with management as consultancy projects related to strategic activities indicate that the IAF has access to and is favourably viewed by the highest-level managers in the organization (Roussy and Brivot, 2016). This suggests that consultancy activities by IAFs may not necessarily lead to a decrease in perceived quality.

Based on the more recent research of Trotman and Duncan (2018), we expect that IAF involvement in consultancy activities will have a positive effect on management perceptions of internal audit quality as these activities are considered value-added. Thus, we pose our second hypothesis:

> *H2: Perceived internal audit quality will be higher when internal auditors perform consulting activities than when internal auditors do not perform consulting activities.*

Above, we posit that IAF use of data analytics increases the perception of internal audit quality through increased efficiency, the ability to analyse a larger portion of the population, and thr use of predictive analytics to recommend strategic actions. We also posit that the performance of consulting activities signals both a favourable perception of the IAF and a stronger management/IAF relationship. Data analytics guidance suggests that among the more challenging aspects of data analytics is the ability to investigate the relevant data and perform the right analyses (Al-Htaybat and von Alberti-Alhtaybat, 2017). The benefits of organizational knowledge from consulting engagements, coupled with the benefits of efficiency and insight of IAF use of data analytics, should result in an interaction effect on the perception of internal audit quality. Specifically, we pose that the use of data analytics will increase the effect of consulting activities on internal audit quality:

> *H3: When internal auditors perform consulting activities, perceived internal audit quality will be higher when internal auditors use data analytics than when internal auditors do not use data analytics.*

Methodology

Participants and procedure

We conduct a 2 (presence versus absence of data analytics) x 2 (presence versus absence of consulting activities) between-subjects experiment. Figure 2 presents the manipulations of the experimental design.

[INSERT Figure 2: Manipulations of the experimental design]

We pilot tested the questionnaire with master's students in internal auditing and PhD students in accountancy to test the understanding of the scenarios and to check manipulations. The results of the pre-test indicated that participants passed the consulting manipulation (Mean No Consulting = 2.90 [N=20] versus Mean Yes Consulting = 7.19 [N=21]; F = 3.213; p = 0.007; two-tailed) and the data analytics manipulation (Mean No Data Analytics = 6.45 [N=22] versus Mean Yes Data Analytics = 8.53 [N=19]; F = 3.181; p = 0.008; two-tailed). In addition, we had several discussions with internal auditors, managers and other researchers, which also helped us improve the experimental design.

The case and the related survey were provided to participants via an electronic link. After reading the consent form, participants were randomly assigned to one of the four case conditions. They were then presented with one of the four scenarios containing information about Electronic Retail Inc., a fictional organization. After reading the scenario, the same questions were presented to each participant. Middle and upper manager participants who worked in the U.S. were recruited using Prolific (Peer *et al.*, 2017). We investigate managers' perceptions given the broad mandate of internal auditing. Management is concerned with both assurance and consultancy in terms of value added, while external auditors would focus solely on assurance of financial information, and internal auditors would focus on the audit process. We obtained answers from 126 participants, but we excluded the answers from six of them because they left the questionnaire prematurely. Therefore, the final sample was composed of 120 participants. We utilised both upper and middle managers as both are likely to have engaged with internal auditors during audit or consulting engagements. This is consistent with prior studies which have utilised managers in experiments to investigate their perceptions of IAFs (Brown and Fanning, 2019; Farkas *et al.*, 2019).

Table I presents participants' descriptive statistics. They averaged just over six years of experience in their current role. Almost 67% of respondents were business managers in privately held organizations and approzimately 16% worked in publicly-traded organizations. The remaining participants are almost evenly divided between not-for-profit-organizations and public sector organizations. The majority, 61%, of the respondents were male.

Respondents self-reported a high level of knowledge of digital technologies (an average of 7.97 on a 0 to 10 Likert scale). Knowledge was measured by four items, adapted from Rose *et al.* (2012). We analyzed these four survey questions using a Principal Component Analysis (PCA). The Cronbach's alpha was above the critical value of 0.7 (score = 0.933) and the percentage of explained variance is above 80%. Thus, we grouped the four items under one single factor describing the global level of knowledge of participants. Table II presents the descriptive statistics of the digital knowledge items. Panel A in Table III indicates the results of the PCA and Panel B in Table III the descriptive statistics of participants' single factor digital knowledge for the four groups.

[INSERT Table I: Description of participants [N=120]]

[INSERT Table II: Descriptive statistics of the digital knowledge scale]

[INSERT Table III: PCA results and summary of participants' single factor digital knowledge]

Experimental design

The case was based on those developed by DeZoort *et al.* (2001) and Glover *et al.* (2008) and is presented in Appendix 1. The case contained four sections, providing information about a fictional organization and its internal audit department. As two conditions were manipulated (the use/non-use of data analytics and the performance/non-performance of consulting activities), four different versions were developed.

The first section of the case provided the general context of the experiment, including text stipulating that participants should assume the role of the CEO of a fictional organization. In order to ensure that the study participants were able to understand the implications of the CEO role within an organization, participants were recruited on Prolific by focusing on the platform's 'Upper Management' and 'Middle Management' profiles. The rest of the section provided a

description of the company, its industry and its business objectives. This section did not contain any manipulations and was the same across all four versions of the case.

The second section provided information about the role of the internal audit department. This was manipulated as either focused solely on assurance activities or dedicated to both assurance and consulting activities.

The third section detailed the work performed and tools used by the internal audit department. The first part of this section described the internal audit department's audit program. The last part of the section contained the manipulation and details of whether the internal audit department performed its work using sampling or full data sets. The term 'analyses based on full data sets' was utilized instead of 'data analytics' to avoid respondent bias related to the term 'data analytics'.

The last section included questions related to the four dimensions of the internal audit quality framework (input, process, output and outcome) as well as demographic questions. This section was the same for all the cases. Figure 3 summarises the flow of the case.

[INSERT Figure 3: Description of the procedure]

Independent variables

The first manipulation involved the extent to which the IAF dedicated its time to consulting activities. Prior research (Betti and Sarens, 2020,) finds that the IAF tends to perform either solely assurance-type work or either a mix of assurance-type and consulting-type works. Also, our manipulation follows the findings of prior research (Brandon, 2010; Soh and Martoinov-Bennie, 2011; Stewart and Subramaniam, 2010) and manipulations used in prior internal audit research (Munro and Stewart, 2010, 2011; Stewart and Subramaniam, 2010;), Additionally, practitioner publications consistently stress the importance of internal auditor engagement in consulting activities to keep relevant, and add value to organizations (Fulton and Parchure, 2018; Jacka, 2016; Piper, 2016; Zwelling, 2019). Therefore, to increase the ecological validity of the study, the presented condition of the first manipulation are line with such practice. We adapted the case developed by DeZoort *et al.* (2001). Both conditions of the manipulation (No Consulting / Yes Consulting) were presented as follows:

No Consulting condition: The case indicates that the internal audit department dedicates 100% of its time to assurance activities and does not perform any consulting activities for management such as improvement or development of processes, involvement in enterprise risk management or other consulting projects.

Yes Consulting condition: The case indicates that the internal audit department dedicates 50% of its time to assurance activities. In addition to assurance activities, the internal audit department dedicates 50% of its time to consulting activities for management such as improvement or development of processes, involvement in enterprise risk management or other consulting projects.

The second manipulation concerns the use of data analytics by internal auditors. Both conditions of the manipulation (No Data Analytics / Yes Data Analytics) were presented as follows:

No Data Analytics condition: The case stipulates that internal auditors perform analyses, testing and reviews based on samples. Once a sample is selected, internal auditors perform manual detailed checks for each selected item. Internal auditors also perform ratio and trend analyses comparing the audit period to prior periods.

Yes Data Analytics condition: The case stipulates that internal auditors perform analyses, testing and reviews of full data sets. Once a full data set is extracted, internal auditors use an application that enables a detailed check for all items. Internal auditors also use the application to predict future events by identifying potential trends or clusters, which enables users to perform simulations to suggest potential actions or recommendations.

Appendix 1 provides the experimental materials.

Dependent variables

This study investigates the effects of the performance of consulting activities and the use of data analytics by internal auditors on perceived internal audit quality. Our purpose was to focus on managers' perceptions. Following Trotman and Duncan (2018)'s framework, we assess perceived internal audit quality with four dimensions, namely: the input, the process, the output,

and the outcome[5]. All variables were measured on 11-point Likert scales (Brandon, 2010; Davidson *et al.*, 2013; DeZoort *et al.*, 2001; Glover *et al.*, 2008).

To assess the input dimension, we asked respondents to what extent they considered the internal audit department (i) competent (Glover *et al.*, 2008; Brandon, 2010; Davidson *et al.*, 2013), and (ii) objective (Glover *et al.*, 2008; Brandon, 2010; Davidson *et al.*, 2013). For the question related to objectivity, we included the IIA Standard's (2017) definition, which states that objectivity is defined as an impartial and unbiased attitude to avoid conflicts of interest.

The process dimension was measured with questions based on Trotman and Duncan's framework (2018). Specifically, questions asked about the likelihood that internal auditors will (i) develop an effective audit methodology and (ii) develop strong working relationships with management. The following definition of an 'effective' methodology was provided: 'an effective methodology is defined as a rigorous methodology in the process and execution to support internal audit's findings and recommendations but flexible enough to address all important risks and issues'.

The third dependent variable addresses outputs. We asked questions related to the quality of the IAF reports, including (i) accuracy and timeliness of the reports and (ii) the ability of the internal audit department to provide relevant recommendations.

Finally, respondents were asked to provide their perception on the extent to which the internal audit department was likely to bring value to the company.

Manipulation checks

At the end of the fourth section, two questions were asked to assess participants' understanding of our manipulations. The data analytics use manipulation was checked by asking: 'on a scale from 0 to 10, please indicate to what extent the internal audit department performs analyses based on samples or analyses based on full data sets'. The consulting activities manipulation was checked by asking 'on a scale from 0 to 10, please indicate to what extent the internal audit department performs consulting activities'.

[5] Although Trotman and Duncan (2018) find that the outcome dimension is the primary focus of management, in order to properly test and extend their work we assess all four dimensions.

Results

Manipulation checks and inter-group equivalence

Manipulation checks suggested that our manipulations were successful. Participants passed the consulting manipulation (Mean No Consulting = 3.03 versus Mean Yes Consulting = 7.38; F = 52.084; p = 0.000; two-tailed), as well as the data analytics manipulation (Mean No Data Analytics = 6.25 versus Mean Yes Data Analytics = 8.54; F = 19.892; p = 0.000; two-tailed). We also tested the equivalence of randomized participant assignment to conditions in terms of knowledge of digital technologies, experience as measured by years in current job, and gender. The results indicate that the four groups were equivalent in terms of knowledge of digital technologies (F = 0.311; p = 0.818; two-tailed), experience in current job role (F = 1.047; p = 0.375; two-tailed) and gender (F = 0.830; p = 0.480; two-tailed). Panel A in Table IV and Table V present the descriptive statistics of the manipulations, while Panel B in these tables shows the results of the manipulation check tests. Table VI shows the equivalence tests between the four groups.

[INSERT Table IV: Test of consulting manipulation check]

[INSERT Table V: Test of data analytics manipulation check]

[INSERT Table VI: Test of equivalence between groups]

Test of hypotheses

Table VII shows the means and standard deviations of respondents' assessments of the quality variables by condition.

To test the hypotheses, we ran general linear models with consulting activities and data analytics as factors.[6] Table VIII presents the results of the general linear models for each of the seven variables.

H1 results indicate that the perceived competency of internal auditors was significantly higher when IAFs use data analytics than when they do not use data analytics (means: 8.76 versus

[6] We also ran tests using organization type (listed versus non-listed) as a control and the results remained unchanged.

8.23; F(1;116) = 3.884; p = 0.051; two-tailed). However, results do not indicate any significant main effect of the use of data analytics on other variables of the internal audit quality framework. Thus, H1 is supported regarding the input dimension.

[INSERT Table VII: Descriptive statistics]

Regarding H2, results suggest that the perceived quality of the relationship between the IAF and management is higher when internal auditors perform consulting activities than when they do not perform consulting activities (means: 7.57 versus 6.70; F(1;116) = 3.560; p = 0.062; two-tailed). Results also indicate that perceived relevance of internal auditors' recommendations wis higher when internal auditors perform consulting activities (means: 8.63 versus 7.88; F(1;116) = 5.434; p = 0.021; two-tailed). However, the results do not indicate a significant main effect of the performance of consulting activities on other variables of the internal audit quality framework. Thus, H2 is supported regarding the process and the output dimensions. The results also suggest no significant difference regarding the level of objectivity of the internal audit department whether the IAF performs consulting activities or not (means: 7.20 versus 7.32; F(1;116) = 0.90; p = 0.765).

[INSERT Table VIII: Test of hypotheses]

Concerning H3, results suggest a significant interaction effect between the performance of consulting activities and the use of data analytics on the perceived quality of the relationship between internal auditors and management (F(1;116) = 4.877; p = 0.029; two-tailed). Figure 4 plots this interaction. When internal auditors use data analytics and perform consulting activities, managers' perceived quality of the relationship between the IAF and management increased. This result supports H3 regarding the process dimension. However, results do not show other significant interaction effects between these two variables on other variables of the internal quality framework.

In summary, H1 is supported regarding the input dimension of the internal audit quality framework, H2 is supported regarding the process and the output dimensions and H3 is supported regarding the process dimension.

[INSERT Figure 4: Actual effects on the perceived quality of the relationship between internal auditors and management]

Discussion and conclusion

This research investigated the effect of the use of data analytics and the performance of consulting activities on managers' perceptions of audit quality. Results suggest that the use of data analytics and the performance of consulting activities have an impact on some components of perceived internal audit quality. The use of data analytics positively influencs the input dimension of the internal audit quality framework, while the performance of consulting activities positively influencs the process and output dimensions. In addition, we observedan interaction effect between these two dimensions. The hypotheses and their results are summarized below, in Figure 5.

Figure 5: Summary of the results

Hypotheses	**Results**
H1: Perceived internal audit quality will be higher when internal auditors use data analytics than when internal auditors do not use data analytics.	Supported for Input
H2: Perceived internal audit quality will be higher when internal auditors perform consulting activities than when internal auditors do not perform consulting activities.	Supported for Process Supported for Output
H3: When internal auditors perform consulting activities, perceived internal audit quality will be higher when internal auditors use data analytics than when internal auditors do not use data analytics.	Supported for Process

Examining first the use of data analytics, our findings indicate that managers perceive the IAF as more competent (input dimension) when it uses data analytics to accomplish its mission. This is likely because data analytics enable the IAF to carry out more targeted and in-depth analyses (Christ *et al.*, 2019; ECIIA, 2019; Protiviti, 2018).

However, the use of data analytics does not seem to directly impact the objectivity aspect of the input dimension as well as the other dimensions of perceived internal audit quality, namely process, output, and outcome. First, managers do not perceive that data analytics impacts the process dimension, which refers to the effectiveness of the methodology and to service interactions. Nevertheless, we did observe an interaction effect as discussed below. Second, contrary to expectations, we observe that the use of data analytics is perceived to affect neither the quality of IAF reports nor the perceived relevance of IAF recommendations (output dimension). However, we acknowledge that internal auditor inputs do not come exclusively from the data; they also derive from the auditors' interpretation of that data, which may explain

the lack of findings. Finally, we also expected an increase in perceived added value (outcome dimensions) when internal auditors use data analytics, but our results do not support this. Our findings that no effect of data analytics was identified on the process, output, and outcome dimensions is surprising given that the literature suggests that data analytics enable advanced analyses not only on past events but also on future events by using predictive analyses (Al-Htaybat and von Alberti-Alhtaybat, 2017). Therefore, it may be that these kinds of analyses enable IAFs to make the audit methodology more effective. Also, data analytics may increase the accuracy and the relevance of recommendations as it allows analyses of full data sets, making the findings fact-based. A further effect on the outcome dimension is that data analytics increase the scope of analyses using less effort, thus doing more with less (PwC, 2018). The fact that the use of data analytics is still not standard in all IAFs could explain the absence of effect. Indeed, recent reports (IIA, 2018, 2019) highlight that the use of data analytics is still limited and is not implemented in an advanced way inside internal audit departments.

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When examining the performance of consulting activities, our results suggest that managers perceive the quality of their relationship with internal auditors as higher when internal auditors perform consulting activities (process dimension). This is consistent with prior research indicating that consulting activities bring value to organizations (Betti and Sarens, 2020; Stewart and Subramaniam, 2010; Castanheira *et al.*, 2010; Soh and Martinov-Bennie, 2011; Chapman, 2001). Also, when internal auditors perform consulting activities, the perceived quality of their recommendations was higher (output dimension). This may be because internal auditors that perform consulting activities better understand auditees' challenges and are therefore in a better position to provide more relevant recommendations. Additionally, it is interesting to note that the performance of consulting activities did not affect the perceived objectivity of auditors from the managers' point of view in this study (input dimension). This contradicts prior research indicating that consulting activities jeopardise the objectivity of internal auditors (i.e. Lenz and Hahn, 2015; Roussy, 2013; Soh and Martinov-Bennie, 2011). However, our findings indicate no impact of consulting on the other parts of the quality framework, namely the competence of internal auditors (input dimension), the effectiveness of the methodology (process dimension), the quality of the reports (output dimension) and the perceived added value of the IAF (outcome dimension). This last result is surprising given that prior research indicates that consulting activities are considered as value-adding activities (i.e. Betti and Sarens, 2020; Soh and Martinov-Bennie, 2015; Stewart and Subramaniam, 2010). Prior research indicates that consulting activities are considered as a way for the IAF to be

closer to strategic risks and to be more involved in enterprise risk management (Allegrini *et al.*, 2011; Stewart and Subramaniam, 2010).

We also hypothesised that when internal auditors perform consulting activities, perceived internal audit quality would be higher with use of data analytics than without. We did observe this effect for the process dimension, specifically concerning the perceived quality of the relationship between internal auditors and management. When internal auditors perform consulting activities with the use of data analytics, internal auditors were perceived to have a better working relationship with management. This may be because digital knowledge is gaining importance in organizations. Additionally, the performance of consulting activities by internal auditors is well perceived by management. Combining these two attributes could be seen as an asset by management, thus increasing the likelihood of a strong working relationship.

From a theoretical perspective, our contributions to the internal audit literature are fivefold. First, we assess perceived internal audit quality holistically by testing Trotman and Duncan's (2018) framework through an experiment. Prior research has mainly assessed perceived internal audit quality based on the input dimension (i.e. Glover *et al.*, 2008; Brandon, 2010; Davidson *et al.*, 2013). This prior research used proxies to assess the quality of an internal audit department relying on the assessment of perceived competence and objectivity of the IAF. Using the entire framework developed by Trotman and Duncan (2018) enabled us to assess internal audit quality in four dimensions: input, process, output and outcome, and on distinct elements within each dimension. Second, this research extends Trotman and Duncan's (2018) framework by considering the influence of an additional contextual factor: digitalization. While Trotman and Duncan's (2018) framework stresses the importance of contextual factors, it does not consider digitalization. It also does not consider the role of data analytics, currently a popular and expanding technology. Our findings suggest that digitalization does impact perceived internal audit quality, specifically IAF use of data analytics. Third, Trotman and Duncan (2018) called for future research on the impact of the nature of the engagement (consulting and assurance) on the internal audit quality. In this research, we find that performing consulting activities enhances managers' perceptions of internal audit quality. Fourth, this research extends Trotman and Duncan's (2018)' work by improving understanding of perceived internal audit quality among managers. Finally, some dimensions of this framework; process, output and outcome, had not been tested before. We were therefore not able to use measures

developed in prior research. As a result, we developed new measures for these three dimensions of the internal audit quality framework.

From a managerial point of view, the use of data analytics, especially combined with the performance of consulting activities, improves managers' perceptions of internal audit quality. This is likely because the use of data analytics can help the IAF manage the complexity of engagement. This technology enables to perform more advanced analyses on full population but also to work on data from multiple sources (Manita *et al*., 2020; Protiviti, 2018). Thus, internal auditors may want to consider increasing their use of data analytics. This raises the question of how the IAF can develop such skills inside internal audit departments. We posit that internal audit departments can improve their data analytics expertise through training existing employees as well as recruiting people with data analytics expertise. It also raises the question whether all internal auditors inside a department should possess data analytics skills or whether internal audit departments should have only some internal auditors specialising in data analytics. Our results also suggest that internal auditors can also increase the proportion of the planning dedicated to consulting activities to strengthen the relationship with management. The recently updated three lines of defense model highlights the importance of this relationship for the IAF to be closer to strategic risks (IIA, 2020).

This research investigated the effect of the use of data analytics and the performance of consulting activities on managers' perceptions of internal audit quality. Our results should be interpreted with caution due to limitations of the current research, but also open opportunities for future research. Firts, the data is self-reported and may reflect perceptions that may not fully reflect reality.thus (Betti *et al*., 2021). Second, this research focused on the perceptions of only one internal audit stakeholder, management. Trotman and Duncan (2018) indicate that the perception of internal audit quality depends on the stakeholder. Future research can therefore investigate the perceptions of other IAF stakeholders such as external auditors. Prior research suggests, for instance, that the more involved an IAF is in operational activities such as consulting, the less objective the IAF is perceived to be by external auditors, thus leading to a low-quality assessment (Glover *et al.*, 2008; Gramling and Myers, 2006; Gramling *et al.*, 2004; Prawitt *et al.*, 2009). Therefore, for external auditors, this suggests that consultancy activities by IAFs may lead to a decrease in perceived quality. Future studies can investigate whether the use of data analytics, which facilitates a more fact-based analysis, may mitigate the possible negative effect of the performance of consulting activities on perceived internal audit quality

of external auditors. Future research can also investigate to what extent internal audit departments should engage in data analytics by considering whether IAFs should have only a few data analytics specialists inside the department or whether every internal auditor in a department should have these skills. Finally, while our results support some statistically significant relationships, we cannot be certain of causality therein.

Despite these limitations our stucy contributes significantly to the literature by further examining the factors and context that influence management's perception of internal audit quality. Future research can examine this relationship in more depth, the perceptions of other stakeholders (external auditors and internal auditors), and can examine internal audit quality perceptions in other contexts.

Appendices

Appendix 1: Experimental case

Assume you are the CEO of Electronic Retail Inc. Based on the information provided below, you will be asked questions related to its internal audit department. Electronic Retail Inc. is based in the U.S. and listed on the New York Stock Exchange. The company buys and sells to consumers various electronic goods such as smartphones, computers, televisions, and household appliances. Electronic Retail Inc. stores are located throughout the United States. Electronic Retail Inc. also sells products to consumers online through its website. In recent years, the company's market share is growing in a stable and continuous way. Electronic Retail Inc. has a culture of continuous improvement of all processes. As part of their objectives, the company wants to become the U.S. market leader through additional penetration therein and by increasing the variety of products available to consumers.

Electronic Retail Inc.'s internal audit department consists of 12 people: 1 head of internal audit, 2 managers, 3 senior internal auditors and 6 junior internal auditors. These 12 internal auditors are full-time employees and the company does not outsource or co-source any internal audit work.

> *No Consulting condition:* The internal audit department dedicates 100% of its time to assurance activities. This refers to the following activities. First, internal auditors perform compliance audits to evaluate if processes comply with company policies and procedures. Second, they evaluate the efficiency and effectiveness of internal control processes and procedures. Finally, they perform an evaluation of processes and practices against known best practices and when applicable against similar companies. The internal audit department does not perform any consulting activities for management such as improvement or development of processes, involvement in enterprise risk management, or other consulting projects.
>
> *Yes Consulting condition:* The internal audit department dedicates 50% of its time to assurance activities. This refers to the following activities. First, internal auditors perform compliance audits to evaluate if processes comply with company policies and procedures. Second, they evaluate the efficiency and effectiveness of internal control processes and procedures. Finally, they perform an evaluation of processes and practices

against known best practices and when applicable against similar companies. In addition to assurance activities, the internal audit department dedicates 50% of its time to consulting activities for management such as improvement or development of processes, involvement in enterprise risk management, or other consulting projects.

The internal audit department reports to the audit committee of the board of directors. Internal auditors appear to have adequate knowledge of Electronic Retail Inc.'s operations, processes, and procedures. Internal audit work appears to be well documented and internal audit staff seems to be adequately supervised.

In line with business objectives, the internal audit department develops the following audit program for each assurance engagement related to processes assessed "high risk":

- The internal auditors conduct interviews with the key personnel involved in the process, including the process owner, in order to gain process understanding.
- The internal auditors review the trial balance and reconciliations.
- The internal auditors perform transaction testing for appropriate approvals, timeliness of processing, and completeness and accuracy of recordings.
- Internal auditors review for compliance with existing policies and procedures, including proper authorization of transactions.
- Internal auditors evaluate IT general and application controls relating to information systems used in the process.
- Audit findings are discussed with process owners during the audit and a draft report is distributed to relevant parties prior to the closing meeting. A formal follow-up process is defined for all open findings from the final report.

No Data Analytics condition: Internal auditors perform analyses, testing and reviews based on samples. Once a sample is selected, internal auditors perform the following types of analyses:

- They perform for each selected item a manual and detailed check of controls, entries, and other relevant documents to detect errors and/or anomalies. This includes identification of missing documents, unexpected variances, improper disbursements, and indications of weaknesses in controls.
- They analyze aggregated data to detect unexpected variations.

- They perform ratio and trend analyses for the audit period versus prior periods.

Yes Data Analytics condition: Internal auditors perform analyses, testing and reviews of full data sets. Once a full data set is extracted, internal auditors perform the following types of analyses:

- They use an application that enables a detailed check of controls, entries, and other relevant documents to detect errors and/or anomalies of the entire population. This includes identification of missing documents, unexpected variances, improper disbursements, and indications of weaknesses in controls.
- They use an application that enables analysis of aggregated data to detect unexpected variations.
- They use an application that enables prediction of future events by identifying potential trends or clusters and enables users to perform simulations to suggest potential actions or recommendations.

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