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Essays on the influence of digitalisation on the internal
audit function

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Abstract

The internal audit function has evolved over recent decades to adapt to the changing business environment. Today, the business environment is increasingly digitalised and requires organisations to adapt. Developed around three essays, this doctoral dissertation investigates how the internal audit function has evolved in a digitalised context in order to help organisations manage risks and achieve their goals. From a theoretical perspective, this doctoral thesis makes two contributions. First, by gathering the perceptions of internal auditors, chief audit executives and senior management, it offers a more holistic and comprehensive view of the effects of the digitalisation of the business environment on the internal audit function. Second, this research contributes to prior research on internal audit quality by considering multiple dimensions of internal audit quality and by investigating digitalisation as a contextual factor that influences perceived internal audit quality. It shows the positive effects of the use of data analytics and the performance of consulting activities by internal auditors on internal audit quality. This doctoral research also provides a methodological contribution through the use of multiple methods. The results were triangulated by combining qualitative and quantitative methods to examine the evolution of the internal audit function in the digitalised business environment. Finally, this doctoral dissertation provides several managerial contributions. First, it highlights the importance for the internal audit function to adapt its scope by developing an agile approach to audit planning. Second, this research highlights that developing an advisory role for the internal audit function brings value to organisations. Relationships between senior management and the internal audit function are crucial for the internal audit function to comprehend the everyday reality of business operations and to align its activities with strategic challenges and the risks introduced by digitalisation. Third, the working practices of internal auditors are evolving as new technologies, and especially data analytics, are progressively integrated into internal audit departments. Therefore, this doctoral thesis emphasises the need for internal audit departments to improve their digital expertise in order to acquire the digital knowledge necessary to audit increasingly digitalised business processes. Internal auditors should also have the appropriate digital skills to harness the potential of new technologies, especially data analytics, to perform their missions.

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Introduction

Research context

‘To successfully adapt, internal auditors will need to embrace technology like never before’, said Richard Chambers (2019, p. 1), president of the Institute of Internal Auditors, setting out his prediction for the internal audit function (IAF) in the 2020s. The use of new technologies by organisations and the digitalisation of the business environment has become a critical topic for the IAF (ECIIA, 2018, 2019). The IAF has evolved over recent decades to adapt to the changing business environment. Today, digitalisation is reshaping the business environment and has been identified as a major driver for the IAF to change (PwC, 2018). The current digitalised environment modifies the organisational risk landscape and brings new challenges to organisations, presenting with more (emerging) risks to manage (Beasley *et al.*, 2018). Digitalisation also changes the working practices of every department inside organisations. Organisations continuously implement new technologies such as data analytics, artificial intelligence or robotics to support their departments (Verhoef *et al.*, 2021). Digitalisation thus brings changes for organisations and leads them to adapt their ways of working. However, the effect of digitalisation on the IAF is still an underexplored area (Chambers, 2014; Roussy and Perron, 2018). The next sections will review the prior research on the evolution of the IAF over the last 30 years, present an overview of digitalisation and identify research gaps that need further investigation in order to better understand the evolution of the IAF in a digitalised environment.

Evolution of internal auditing

Internal audit is positioned within the organisation as a third line of defence to manage risks (IIA, 2020). The first line is directly involved in the delivery of products or services with clients, whereas the second line provides support on risk matters and monitors risks. Management is responsible for both lines. As the third line of defence, internal audit ‘provides independent and objective assurance and advice on the adequacy and effectiveness of governance and risk management’ (IIA, 2020, p. 3). Although the IAF reports its findings to management as well as the governing body, it is accountable only to the governing body, ensuring independence. This independence from management is essential to the IAF’s authority, credibility and objectivity

in performing its duties (IIA, 2020). The IAF has evolved over recent decades to adapt to the changing business environment.

In the 1990s, the IAF started to expand its scope outside finance and accounting to perform audits on organisational controls (Cooper *et al.*, 1994; Gupta and Ray, 1992). In this period, the IAF went ‘beyond the financial accounting area to the operation management area’ (Jin’e and Dunjia, 1997, p. 2) and started to embrace a consulting role by performing more consulting activities for management (Krogstad *et al.*, 1999).

In the early 2000s, the implementation of regulations following various US scandals led the IAF to change its scope and role (Jones *et al.*, 2017; Soh and Martinov-Bennie, 2011). The implementation of regulations around the world (i.e. Sarbanes-Oxley in the US; the Turnbull report in the UK) expanded the role of corporate governance and consequently broadened the role of the IAF (Gramling *et al.*, 2004). The concept of risk became central to corporate governance and led the IAF to progressively change from a control-based approach to a risk-based approach (Aghghaleh *et al.*, 2014; Spira and Page, 2003). After that, the risk-based approach was increasingly used in IAFs (Castanheira *et al.*, 2010; Gramling *et al.*, 2004; Sarens and De Beelde, 2006; Soh and Martinov-Bennie, 2011). In this period, the IAF also refocused its scope towards assurance activities and focused more on internal controls and less on internal consulting projects for management (Hass *et al.*, 2006).

The economic crisis at the end of the 2000s raised questions of the IAF’s ability to protect society from such events (Chambers, 2008; Chambers and Odar, 2015) and of its role in the corporate governance debate (Lenz and Sarens, 2012; Sarens *et al.*, 2009). For Chambers and Odar (2015), corporate governance, including internal audit, had failed in preventing the economic crisis of the late 2000s. They advocated the expansion of the role of the IAF to the audit of governance processes and encouraged the IAF to go beyond compliance with processes by considering the inputs and outputs of these processes and by reporting any unacceptable levels of risk. Accordingly, the IAF changed and played a more proactive role in the establishment of enterprise risk management in organisations (Castanheira *et al.*, 2010; IIA, 2009).

In the 2010s, the performance of consulting activities in the IAF increased, becoming more oriented towards business improvement processes and efficiencies (Soh and Martinov-Bennie, 2011; Stewart and Subramaniam, 2010). Recent research argues that even if assurance activities

remain at the core of internal audit engagements, consulting activities will still increase over time, for instance in the environmental, social and governance domains (Soh and Martinov-Bennie, 2015). The IAF increasingly faces demands outside its traditional compliance and financial focus. Consulting activities are perceived by internal auditors as an instrument to add value to the organisation (Stewart and Subramaniam, 2010). The results of a study conducted among internal audit practitioners indicate that internal audit scope will be increasingly focused on strategic reviews, enterprise risk management, corporate governance, sustainability and ethics at the expense of compliance and operational audits (Allegrini *et al.*, 2011). Nevertheless, several researchers point out that performing both consulting and assurance activities could lead the IAF to face role ambiguity and jeopardise its independence and objectivity (Lenz and Hahn, 2015; Roussy, 2013; Soh and Martinov-Bennie, 2011).

In 2020, the Institute of Internal Auditors issued an updated version of the three lines of defence model presented in 2013 (IIA, 2013, 2020). Figure 1 presents the 2013 version and Figure 2 presents the updated model from 2020. The new version brings four main changes.

First, unlike the 2013 model, the 2020 model stresses the importance of the IAF providing both assurance and advice to organisations, not solely assurance. This is in line with prior research that highlighted the tendency of the IAF to adopt a more advisory role.

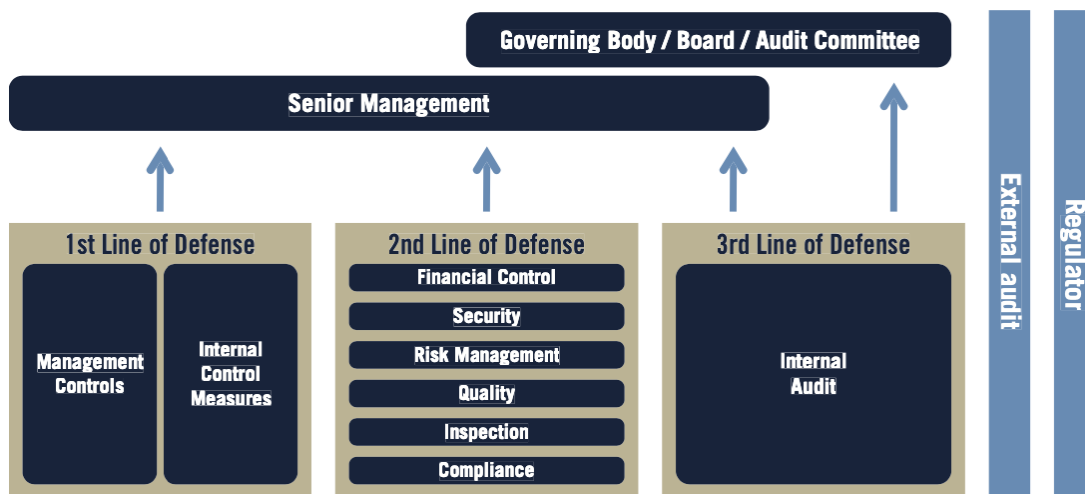
Second, the 2020 model provides more clarity concerning the accountability and reporting lines with management and governing body. Unlike the 2013 model, the updated model shows that the IAF is accountable only to the governing body as opposed to both senior management and the governing body. This accountability to two different stakeholders may previously have caused role ambiguity due to trying to meet (different) expectations from management on the one hand and to the audit committee on the other (Roussy, 2013). The new model clarifies this aspect by identifying only one body to which the IAF is accountable.

Third, the 2020 model gives more importance to the relationship between senior management and internal audit in order for internal audit to be closer to strategic risks and to be considered a trusted advisor and strategic partner. The double-headed arrow linking management and the IAF is entitled ‘Alignment, Communication, Coordination, Collaboration’. This aspect was not present in the 2013 model and highlights the importance of the IAF being closer to management.

Finally, the report presenting the updated three lines of defence model (IIA, 2020) stresses that

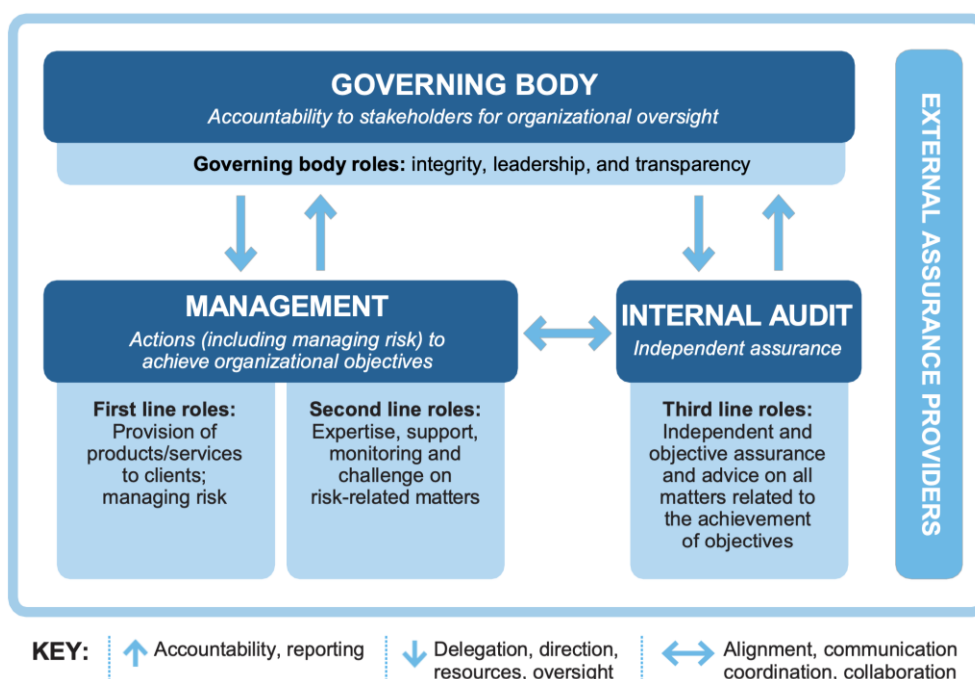
organisations are now navigating an increasingly interconnected, complex, uncertain and volatile environment and that the IAF needs to take this changing environment into consideration. Digitalisation is precisely associated with volatility, uncertainty and complexity (Schoemaker *et al.*, 2018).

Figure 1: Three lines of defence model 2013



Source: IIA (2013)

Figure 2: Three lines of defence model 2020



Source: IIA (2020)

Digitalisation

Legner *et al.* (2017) describe ‘digitalisation’ as the adoption and use of digital technologies in organisational, societal and individual contexts. Verhoef *et al.* (2021) identify it as the way ‘IT or digital technologies can be used to alter existing business processes’. Digitalisation is often confused with ‘digitisation’ and ‘digital transformation’.

‘Digitisation’ refers to ‘the technical process of converting analog signals into a digital form, and ultimately into binary digits’ (Legner *et al.*, 2017, p. 301) in order for computers to transmit information (Verhoef *et al.*, 2021). Unlike ‘digitisation’, digitalisation does not refer to a technical process; rather, it refers to the adoption and use of digital technologies in business lives and the associated changes this induces (Riedl *et al.*, 2017). In digitalisation, digital technologies serve as a means to change and optimise existing business processes (Verhoef *et al.*, 2021).

‘Digital transformation’ refers to ‘company-wide change that leads to the development of new business models’ (Verhoef *et al.*, 2021, p. 891). It goes beyond digitalisation as it affects organisations at a higher level by changing their business logic (Li *et al.*, 2018; Verhoef *et al.*, 2021).

In the framework of this doctoral thesis, we aim to investigate the evolution of the IAF in a digitalised business environment and, especially, to investigate how digital technologies affect the IAF’s working practices and processes. Therefore, we will build on the definitions of Verhoef *et al.* (2021) and Legner *et al.* (2017) and focus on the way digitalisation – the way digital technologies change processes and practices – influences the IAF.

The business environment has seen three waves of digitalisation (Mertens and Wiener, 2018): the development of computers, the emergence of the internet and the development of SMACi technologies (social, mobile, analytics, cloud computing and the internet of things). These technologies are increasingly being integrated into individuals’ daily, private and professional lives and lead organisations to adapt their strategies and processes (Legner *et al.*, 2017; Verhoef *et al.*, 2021).

This digitalised business environment brings new challenges and risks for organisations (Beasley *et al.*, 2018). Data security, for instance, has become a key consideration for organisations (Dzuranin and Malaescu, 2016). Between 2011 and 2018, the number of

cybersecurity breaches disclosed by publicly traded organisations increased fourfold (Coleman *et al.*, 2018). Accordingly, organisations adapt their strategies and ways of working to meet the requirements of these emerging risks and challenges. They are, for example, incorporating digital technologies into their strategy (Kane *et al.*, 2016) and adapting their processes by including digital technologies in their day-to-day work (Legner *et al.*, 2017), such as data analytics, artificial intelligence, the internet of things and robotics (McKinsey, 2018; PwC, 2018).

The rapid growth of digitalisation challenges the IAF to evolve in this changing environment to meet the requirements introduced by digitalisation (ECIIA, 2018, 2019) and to face the new challenges and risks (PwC, 2018) it presents.

Research motivations

The evolution of the IAF in the digitalised business environment is still an underexplored area and has been identified as requiring investigation (Chambers, 2014; Roussy and Perron, 2018). This doctoral thesis investigates how the digitalisation of the business environment influences the IAF. Specifically, the motivations underlying this doctoral research are threefold.

First, recent research specifically highlights that we still have limited knowledge about the influence of digitalisation on the internal audit role, scope and working practices (Chambers, 2014; Roussy and Perron, 2018). The primary aim of this research is therefore to respond to this gap by developing more knowledge about how internal audit practices are evolving to adapt to the digitalised environment in terms of audit methodology, role inside the organisation and also how the IAF takes advantage of digital technologies.

Second, Trotman and Duncan (2018) recently developed an internal audit quality conceptual framework based on qualitative interviews to assess internal audit quality in different aspects of the IAF. This conceptual framework stresses the importance of the environment in understanding internal audit quality, but does not investigate the context of digitalisation. This doctoral thesis therefore aims to investigate how the use of digital tools by the IAF influences internal audit quality.

Finally, perceptions of the IAF differ between stakeholders (Trotman and Duncan, 2018). As highlighted by the updated three lines of defence model (IIA, 2020), the relationship between senior management and internal auditors has become critical for the IAF to be at the forefront

of strategic challenges. The perceptions of these two stakeholders will be gathered in this thesis. On the one hand, talking to or submitting questionnaires to internal auditors and chief audit executives enabled us to collect various data from internal audit practitioners. On the other hand, gathering insights from senior management gave insight into business challenges and an understanding of how the IAF could position itself to be close to strategic risks and challenges that organisations face due to digitalisation. This doctoral dissertation does not investigate insights from other internal audit stakeholders such as audit committee members, external auditors and auditees, however. In addition, questionnaires were sent and interviews conducted with in-house employed internal auditors. We did not, however, seek the opinions of outsourced internal auditors (who are employed by external providers of assurance and consulting services and provide internal audit services to different organisations) in this study.

Objectives and research questions

This doctoral dissertation investigates how the digitalisation of the business environment influences the IAF. Specifically, this thesis intends to address the following research questions:

- How has the IAF evolved in this digitalised environment?
 - How has digitalisation influenced the scope of work of the IAF, its role within the organisation and the working practices of internal auditors?
 - How does the IAF modify its activities and practices in relation to the organisation's level of digitalisation?
- What effects do the use of data analytics and the performance of consulting activities have on perceived internal audit quality?

To address the above research questions, this doctoral dissertation will be organised around three essays that will be detailed in the following sub-sections.

Essay 1

The first essay is entitled *Understanding the internal audit function in a digitalised business environment*. It investigates how the IAF has evolved in the current digitalised environment. Based on semi-structured interviews conducted in Belgium, this essay aims to investigate the evolution of three aspects of the IAF in a digitalised environment: its scope of work, its role within the organisation and the working practices of internal auditors. This essay takes a multi-stakeholder approach and gathers the perceptions of chief audit executives, members of

management committees and internal auditors to obtain a more complete view of the evolution of the IAF.

The main contribution of this essay is to provide a better understanding of how the IAF's scope, role and working practices have changed in the digitalised business environment. First, this research highlights that the scope of internal audit planning is more oriented towards IT risks, which have increased in importance. Internal audit planning is also required to be more agile to cope with the volatility and uncertainty associated with a digitalised environment. Second, this research highlights that the role of the IAF is more oriented towards advisory and consulting activities, which are becoming increasingly crucial. These activities are perceived by members of management committees as valuable in helping the organisation to face the challenges and risks that derive from digitalisation. They expect the IAF to act much more as a business partner and less as a controller. Finally, internal auditors are adapting their working practices, which challenges their digital knowledge on two levels. On the one hand, organisations are becoming more digitalised by integrating new technologies into business processes, for instance. This implies that internal auditors must understand these technologies and develop a certain level of digital expertise. On the other hand, internal audit departments are integrating new technologies to improve their daily work. Specifically, the IAF is using more data analytics, which requires internal auditors to have digital skills.

This research was presented at the 16th *European Academic Conference on Internal Audit and Corporate Governance* in April 2018 and was published in the *Journal of Accounting & Organizational Change* in October 2020.

Essay 2

The second essay in this doctoral dissertation is entitled *Effects of digitalisation of organisations on internal audit activities and practices*. It aims at testing the conceptual framework developed in the first essay. Specifically, it investigates how the IAF modifies its activities and practices in relation to the organisation's level of digitalisation at two levels: the kind of activities performed by the IAF and the use of data analytics by internal auditors. This research is focused on chief audit executives.

The main contribution of this essay is the testing of the conceptual model developed in Essay 1 with a survey. The first essay identified the increasing use of consulting activities and the use

of data analytics as two major changes in the evolution of the IAF. This second essay builds on these findings by examining the influence of digitalisation on the performance of consulting activities and the use of data analytics and by investigating the mediating role of data analytics in the relationship between digitalisation and the performance of consulting activities.

This research specifically shows that the organisation's level of digitalisation is positively related, on the one hand, to the percentage of the internal audit planning dedicated to consulting activities and, on the other hand, to the percentage of use of data analytics by internal auditors. In addition, it shows that the percentage of use of data analytics by internal auditors mediates the relationship between the organisation's level of digitalisation and the percentage of consulting activities performed by the IAF. This essay therefore confirms the findings emerging from Essay 1, but also extends them by showing how the use of data analytics can promote the performance of consulting activities by internal auditors.

This research was presented at the 17th *European Academic Conference on Internal Audit and Corporate Governance* in April 2019 and at the 2nd *EIASM Workshop on Governance and Management of Digitalization* in October 2019.

Essay 3

The third essay, entitled *The impacts of the use of data analytics and the performance of consulting activities on perceived internal audit quality*, investigates the effects of the digitalisation on perceived internal audit quality. This research is based on the internal audit quality framework developed by Trotman and Duncan (2018). This framework identifies four dimensions to assess the quality of an IAF: input, process, output and outcome. This research focuses on middle and upper managers' perceptions of internal audit quality.

In this essay, we examine the effects of the use of data analytics and the performance of consulting activities by internal auditors on the four dimensions of the internal audit quality framework with a 2x2 between-subject experiment, where we manipulate the use of data analytics during internal audit engagements (either full use or absence of use of data analytics) and the performance of consulting activities by internal auditors (either internal audit planning being equally dedicated to consulting and assurance activities or only to assurance activities).

The main contribution of this essay has been to test the conceptual framework developed by Trotman and Duncan (2018). This framework considers four dimensions of internal audit

quality. We tested the effects of the use of data analytics and the performance of consulting activities on these four dimensions. This study first shows that the perceived competency (input dimension) is higher when internal auditors use data analytics. Secondly, this research demonstrates that the perceived quality of the relationship between internal auditors and the management (process dimension) as well as the perceived relevance of internal auditors' recommendations (output dimension) are higher when internal auditors perform consulting activities. Third, a significant interaction effect is highlighted between the performance of consulting activities and the use of data analytics on the perceived quality of the relationship between internal auditors and management. This implies that the quality of the relationship between the IAF and management will be highest when internal auditors perform consulting activities and use data analytics.

This research was presented at the 3rd *EIASM Workshop on Governance and Management of Digitalization* in November 2020.

Epistemological positioning

Epistemology is the study of the nature of knowledge and the process of generation of knowledge (Creswell and Plano Clark, 2017; Grbich, 2012; Bryman, 2016). The epistemological approach reflects the scientific positioning of the researchers and influences their way of seeking knowledge (Creswell and Plano Clark, 2017).

Internal audit literature is mainly dominated by three main epistemological approaches: positivism, interpretivism and post-positivism. In the positivist approach, one single reality exists. This reality is objective, observable, divisible and accurately measurable with statistics (Wildemuth, 1993; Hudson and Ozanne, 1988). In the interpretivist approach, multiple realities exist. These realities are subjective (reflect individual perceptions) and are socially constructed (Wildemuth, 1993; Hudson and Ozanne, 1988). Post-positivism combines positivist and interpretivist assumptions. This doctoral thesis adopts a post-positivist epistemological positioning.

In the post-positivist approach, researchers believe in a single reality, but they also believe that interactions with the environment influence individual perceptions (Creswell and Plano Clark, 2017). The post-positivist approach favours pluralism of methods to get closer to reality, the research methods being chosen based on the research question (Patton, 2014; Wildemuth,

1993). Mixing quantitative and qualitative methods enables researchers to access different views of both the single and context-related reality (Caracelli and Greene, 1993; Creswell and Plano Clark, 2017). The dearth of literature on the influence of digitalisation on the IAF meant that qualitative methods were most appropriate initially in order to gain an in-depth understanding of how the IAF has evolved in an increasingly digitalised business environment. Then, quantitative methods were used to test theoretical frameworks in the second and third essays.

As this research takes a post-positivist positioning, we used a triangulated approach and considered complementary methods (i.e. in-depth interviews, survey and experiments) to gain a better understanding of the influence of digitalisation on the IAF. This multi-method approach enables to obtain a more complete view of the IAF in the digitalised business environment. In line with the post-positivist approach, the method used in each essay was chosen based on the research questions each essay attempts to answer (Patton, 2014; Wildemuth, 1993). The first essay aims at gaining an in-depth understanding of how the IAF has evolved in a digitalised environment. Therefore, we decided to conduct in-depth interviews with internal audit practitioners and members of management committees. This first essay provides a conceptual framework, identifying how digitalisation influences the scope, role and working practices of internal auditors. It is the cornerstone of this doctoral dissertation, as it forms the basis on which the other two essays are built. The second essay aims at testing some elements of the conceptual framework developed in the first essay. A survey of chief audit executives was therefore favoured here. The third essay aims at examining the effect of digitalisation on the IAF by specifically investigating the effects of the digitalisation of organisations on perceived internal audit quality. A key aim of this study was to identify causal relationships. Therefore, a scenario-based experiment with middle and upper managers was conducted.

Research contributions

The overall purpose of this doctoral dissertation is to gain a better understanding of how the digitalisation of the business environment influences the IAF. The contributions of this research are theoretical, methodological and managerial.

From a theoretical perspective, this doctoral thesis provides a more holistic and comprehensive view of the effects of digitalisation on the IAF by gathering different stakeholders' perceptions and capturing various dimensions of the internal audit quality. First, most earlier research has

investigated the perception of only one IAF stakeholder. However, the perception of the IAF can vary among stakeholders (Trotman and Duncan, 2018). This doctoral research gathered the perceptions of internal auditors, chief audit executives and senior management to gain a better understanding of the evolution of the IAF's scope, role and activities in a digitalised business environment as well as to understand the evolution of the IAF's relationship with senior management. Second, this research considers multiple dimensions of perceived quality, while prior research primarily focused on the competence and objectivity of internal auditors to assess internal audit quality. Considering multiple dimensions offers us a more complete and holistic view of managers' perceptions. It also extends prior research by considering digitalisation as a contextual factor that influences the perceived internal audit quality.

From a methodological point of view, the main contribution of this doctoral dissertation is the use and triangulation of multiple methods to capture and confront different perspectives on the effects of digitalisation on the IAF. Combining qualitative and quantitative methods to examine the evolution of the IAF in the digitalised business environment enabled to better understand the different stakeholders' perceptions with in-depth interviews but also to confirm the findings that emerged from the interviews and to further investigate the processes that come into play with a survey and an experiment.

From a managerial perspective, the main contribution of this doctoral research is to provide a better understanding of how internal auditors can bring value to organisations and meet the requirements of scope, role, working practices and skills that digitalisation induces. This research first highlights the necessity for the IAF to adapt its scope by developing a more agile approach. Second, it stresses the importance, in a digitalised context, of advisory activities for the IAF to become a business partner and help organisations, specifically senior management, to deal with the current digitalised and volatile business environment. Third, the importance of using data analytics for internal auditors is highlighted. Integrating this technology is considered foundational for the integration of other complex technologies and audit methodologies, such as artificial intelligence and continuous auditing. Data analytics can help the IAF to perform its work more efficiently and to develop its advisory role inside the organisation. Finally, this research demonstrates the importance for internal auditors to improve their digital expertise so they can use the new technologies adopted by their departments to support their work and better understand the increasingly digitalised processes they audit.

The following chapters present the three essays incorporated in this doctoral dissertation.

Chapter 1: Understanding the internal audit function in a digitalised business environment

Nathanaël Betti and Gerrit Sarens

Introduction

In recent years, the business environment has changed rapidly to become highly digitalised (Beasley *et al.*, 2018; Kane *et al.*, 2016). The volume of digital content being created worldwide is growing exponentially. According to the International Data Corporation (2018), about 5 zettabytes¹ (Zb) of digital content was generated around the globe in 2011, increasing to 33 Zb in 2018, and this figure is predicted to reach 175 Zb in 2025. Digitalisation also induces changes in customer behaviour. PwC (2015) reports that these fluctuations will continue to change in a disruptive way in the coming years. Consequently, organisations are working to adapt their strategies to cope with this new business environment (PwC, 2015) by including digital in their strategy in the near future (Kane *et al.*, 2016).

Most changes in the business environment result in modifications in the risks that organisations need to manage. These risks, including data security and privacy threats, are constantly evolving and becoming increasingly complex (PwC, 2015). The Standards of the Institute of Internal Auditors (IIA, 2017) state that the internal audit function (IAF) is required to develop and adjust the internal audit planning in relation to changes occurring in the business environment and to changing risks. In line with the Standards, the literature highlights the importance of broadening the scope of the IAF to encompass corporate governance, information technology (IT) and strategic issues (Soh and Martinov-Bennie, 2011, 2015). Digitalisation induces changes for organisations (PwC, 2015); however, there is still limited knowledge about the evolution of the IAF in relation to these changes in the business environment. Based on qualitative methods, the present research aims to understand how the IAF is evolving in this changing and increasingly digitalised environment. Therefore, the following research question is formulated: How has the internal audit function evolved in this digitalised environment?

To answer this question, the research objectives are threefold. First, this research aims to

¹ One zettabyte equals one trillion gigabytes.

investigate how the digitalisation of the business environment has shaped the scope and planning of the IAF. Second, the study intends to investigate how the role of the IAF within organisations has evolved and what is expected from internal auditors in this evolving digitalised context. Third, this research explores to what extent the working practices of the IAF (i.e. the ways in which internal auditors carry out their tasks) are changing due to the digitalisation of the business environment.

This research has been conducted in a context characterised by a high level of importance being assigned to digitalisation and technological developments. Such developments induce risks that organisations need to manage as well as raising questions about the use and protection of collected data. From this perspective, the General Data Protection Regulation was enacted in the European Union in May 2018 to delineate the rules for the use and protection of data (ECIIA, 2018, 2019).

The paper is organised as follows. First, the theoretical background and the methodology are developed. Subsequently, the analysis of the results is presented. Then, the results are discussed, and the theoretical and managerial contributions are outlined. Finally, the limitations of the study and suggestions for future research are highlighted.

Background and research question

Digitalisation

There is often confusion between the terms ‘digitisation’ and ‘digitalisation’ when describing the use of technologies (Legner *et al.*, 2017). Digitisation refers to ‘the technical process of converting analog signals into a digital form, and ultimately into binary digits’ (Legner *et al.*, 2017, p. 301), whereas digitalisation is ‘the process of introducing digital technologies, which essentially deal with changes caused by information technologies’ (Riedl *et al.*, 2017, p. 475). Therefore, the latter ‘describes the manifold sociotechnical phenomena and processes of adopting and using these technologies in broader individual, organisational, and societal contexts’ (Legner *et al.*, 2017, p. 301).

The digitalisation of the environment is not a new phenomenon (Mertens and Wiener, 2018). The world has faced several waves of digitalisation that have impacted both the business and wider society, including the creation of computers and the emergence of the internet. Nowadays, the growing presence of social, mobile, analytics and cloud computing (SMAC)

technologies is becoming increasingly integrated into people's professional and private lives (Legner *et al.*, 2017). The introduction of these technologies is reshaping the environment and leading organisations to rethink their strategies, processes and business models (Bouwman *et al.*, 2018).

This changing business environment modifies the organisational risk landscape and brings new challenges to organisations, presenting with more (emerging) risks to manage (Beasley *et al.*, 2018). For instance, data security is becoming a key concern for organisations (Dzuranin and Malaescu, 2016). Between 2011 and 2018, the number of disclosed cybersecurity breaches of publicly traded organisations' systems increased fourfold (Coleman *et al.*, 2018). Accordingly, organisational strategies need to change to meet these emerging challenges. Organisations are thus incorporating digital issues and opportunities into their strategy (Kane *et al.*, 2016) and rethinking their processes to include more and more elements of digital technologies in their day-to-day operations (Legner *et al.*, 2017). Blockchain, data analytics, artificial intelligence, the internet of things and robotics are prime examples of new technologies that organisations are integrating or will integrate in the near future (McKinsey, 2018; PwC, 2018). The rapid growth of digitalisation raises questions about the role of the IAF in this changing environment.

Evolution of the internal audit function

According to PwC (2018), the IAF should evolve by integrating new technologies and digital knowledge to face the new challenges and risks that emerge with digitalisation. In recent decades, the IAF has evolved to meet the requirements of the changing business environment.

During the 1990s, the IAF started to expand its scope beyond finance and accounting by performing audits on organisational controls (Cooper *et al.*, 1994; Gupta and Ray, 1992). During this period, internal auditors also started to embrace a consulting role and began performing more consulting activities for management (Krogstad *et al.*, 1999).

In the early 2000s, the implementation of regulations following scandals in the US changed the scope and the role of the IAF (Jones *et al.*, 2017; Soh and Martinov-Bennie, 2011). The concept of risk became central to corporate governance and, in this sense, the scope of the IAF progressively changed from a control-based approach towards a risk-based approach (i.e. Aghghaleh *et al.*, 2014; Spira and Page, 2003). The IAF refocused its scope towards assurance activities by focusing more on internal controls and less on internal consulting projects for

management (Hass *et al.*, 2006).

Nevertheless, the economic crisis at the end of the 2000s raised questions around the ability of the IAF to protect society from such events (Chambers, 2008; Chambers and Odar, 2015). Consequently, the role of the internal audit changed from a backroom function to a more visible one (Aghghaleh *et al.*, 2014), and the IAF came to play a proactive role in the establishment of enterprise risk management in organisations (Castanheira *et al.*, 2010; IIA, 2009).

During the 2010s, the involvement of the IAF in consulting activities increased again, becoming increasingly oriented towards business improvement processes and efficiencies (Soh and Martinov-Bennie, 2011; Stewart and Subramaniam, 2010). Recent research argues that, even if assurance activities remain at the core of internal audit engagements, consulting activities will increase over time (Soh and Martinov-Bennie, 2015) as these activities are perceived by internal auditors as an instrument to add value to the organisation (Stewart and Subramaniam, 2010) and a mechanism for them to take on a more strategic role in the organisation (Chapman, 2001). However, several researchers have highlighted that performing both consulting and assurance activities could lead the IAF to face role ambiguity and could jeopardise its independence and objectivity (Lenz and Hahn, 2015; Roussy, 2013; Soh and Martinov-Bennie, 2011).

The evolution of the IAF over the years appears to have been influenced by the business environment in which organisations operate (Jones *et al.*, 2017; Sarens *et al.*, 2012). Involvement in consulting activities is linked to the evolution of the economic and regulatory environment, and the IAF tends to focus more on assurance activities during periods that follow a worldwide economic crisis or financial scandal (Stewart and Subramaniam, 2010). We now need to consider how digitalisation of the business environment has shaped the IAF. From the perspective of the expanding status of the IAF, it is worth exploring how the changing, increasingly digitalised environment could affect the IAF as the business environment and the resulting organisational strategies are among the main inputs for the IAF to develop its planning (IIA, 2017). Digitalisation can be seen as an environmental factor affecting organisations and the ways in which they are structured. The existing literature investigates the effects of digitalisation and the use of digital tools in the external audit profession (Canning *et al.*, 2018; Dowling and Leech, 2014) such as the use of data analytics by external auditors (Appelbaum *et al.*, 2017; Perols *et al.*, 2017). However, the literature suggests that the impact of digitalisation on the IAF's role and its effect on internal audit practices is still an underexplored area (Chambers, 2014; Roussy and Perron, 2018). Thus, the current research specifically aims

to understand how digitalisation is affecting the IAF.

Methodology

Data collection

In this study, we have employed a qualitative research methodology to gain an understanding of the evolution of the IAF in a digitalised business environment. In-depth interviews were conducted with professionals to understand their perceptions, motivations and opinions (Stokes and Bergin, 2006). The professionals selected for the interviews were members of management committees, chief audit executives (CAEs) and internal auditors. Interviewing members of management committees who are involved directly in strategic issues enabled us to obtain another point of view on the changes that digitalisation induces in organisational strategy, processes and working habits.

Informants were recruited with the aim of ensuring varied perceptions and maximising the consistency and representativeness of the findings (Rubin and Rubin, 2011; Strauss and Corbin, 1990). We selected some professionals working for organisations that are active in the financial sector and some with organisations operating in the non-financial sector, which face different levels of regulation. These organisations are based in Belgium. The General Data Protection Regulation was enacted in the European Union in May 2018. Issues related to the use of consumer data are critical in the European Union, and Belgium is a suitable representative of this European context.

Data collection started with 15 informants who are CAEs or members of management committees. An interview guide (see Appendix 1) was developed based on the literature review (Miles and Huberman, 1994). Semi-structured interviews were conducted to gather informants' perceptions on some predefined topics while letting them raise other relevant topics that were not included in the guide (Rubin and Rubin, 2011). No questions directly linked to digitalisation were included in this interview guide as we wished to avoid making this topic too salient. The aim of this was to observe whether informants would talk spontaneously about digitalisation. Almost all of the informants did raise this topic. Therefore, 14 additional informants who are CAEs or internal auditors were interviewed for the purpose of enriching the corpus by gathering additional perceptions and views to further explore the internal audit practices related to new technologies. The guide used for these additional interviews is presented in Appendix 2.

In total, 29 informants were interviewed. Each interview lasted between 32 and 98 minutes. Taken together, the transcriptions of the 29 interviews comprise 367 pages and 218,738 words. When no new content emerged from the data, theoretical saturation was considered to have been reached (Rubin and Rubin, 2011; Strauss and Corbin, 1990). Table I presents a description of the informants' profiles.

Table I: Description of the informants' profiles

Informants	Positions	Organisations	Sectors
Informant 1	CAE	Organisation 1	Telecommunications
Informant 2	Senior management	Organisation 1	Telecommunications
Informant 3	CAE	Organisation 2	Banking and insurance
Informant 4	Senior management	Organisation 2	Banking and insurance
Informant 5	CAE	Organisation 3	Banking and insurance
Informant 6	Senior management	Organisation 3	Banking and insurance
Informant 7	CAE	Organisation 4	Engineering
Informant 8	Senior management	Organisation 4	Engineering
Informant 9	Senior management	Organisation 5	Automotive
Informant 10	CAE	Organisation 5	Automotive
Informant 11	CAE	Organisation 6	Entertainment
Informant 12	Senior management	Organisation 6	Entertainment
Informant 13	CAE	Organisation 7	Fast-moving and consumer goods
Informant 14	CAE	Organisation 8	Services
Informant 15	CAE	Organisation 9	Healthcare
Informant 16	CAE	Organisation 10	Banking and insurance
Informant 17	CAE	Organisation 11	Telecommunications
Informant 18	CAE	Organisation 12	Fast-moving and consumer goods
Informant 19	Senior internal auditor	Organisation 12	Fast-moving and consumer goods
Informant 20	CAE	Organisation 13	Banking and insurance
Informant 21	Internal audit manager	Organisation 13	Banking and insurance
Informant 22	Internal audit manager	Organisation 14	Banking and insurance
Informant 23	Senior internal auditor	Organisation 15	Manufacturing
Informant 24	Group internal auditor	Organisation 15	Manufacturing
Informant 25	CAE	Organisation 16	Engineering
Informant 26	Senior internal auditor	Organisation 16	Engineering
Informant 27	Group internal auditor	Organisation 17	Banking and insurance
Informant 28	Internal audit manager	Organisation 17	Banking and insurance
Informant 29	CAE	Organisation 18	Chemical

Data analysis

Thematic analysis was used to analyse the interview data. Thematic analysis is a method of qualitative analysis that identifies, analyses and reports patterns (themes) within data (Braun and Clarke, 2006; Braun *et al.*, 2015).

The researchers followed the six phases of analysis developed by Braun and Clarke (2006) to analyse the data. First, each researcher read the different transcripts closely to become familiar with the data. It enabled them to obtain a holistic understanding of the informants' views and perspectives. Second, each researcher coded the interviews using NVivo 11 software to generate initial codes. Open and axial coding methods were used to identify perceptions from the interviews (Strauss and Corbin, 1990). In this coding phase, they coded the data set for a specific research question, following a theory-driven approach, and as a result, they engaged with the literature prior to the analysis (Braun and Clarke, 2006; Braun *et al.*, 2015). Once the interviews were coded, matrices for each case were used to summarise the data and facilitate comparisons between organisations and functions (Miles and Huberman, 1994). Third, each researcher searched for themes by sorting the different codes and collating them within the identified themes (Braun and Clarke, 2006). Fourth, they reviewed and refined those themes. During these first four phases, the researchers started the analysis independently and then met to compare their analyses to develop a shared view and understanding of the data (Goulding, 1999; Strauss and Corbin, 1990). Fifth, they defined and named themes. In this case, the researchers defined three themes: the scope of the IAF, the role of the IAF and the working practices of internal auditors. Finally, they produced the report by presenting and interpreting the findings. In this last phase, the researchers broadened their analysis by relating their claims to the literature and relevant theories to enhance the interpretation of the results (Braun and Clarke, 2006; Braun *et al.*, 2015).

Results

The findings section is divided into three subsections. The first subsection presents how the digitalisation of the environment has shaped the scope of the IAF, the second subsection highlights how it has changed the role of the IAF, and the third subsection presents the evolution of IAF working practices in the digitalised environment.

Changing scope

[Digital] was not a dimension that was necessarily integrated in the past so we will have to integrate it more and more to be able to better adapt to the final customer. So, it takes a change of behaviour, of tools and, consequently, it will have to be integrated into the strategy. (Informant 10, CAE)

In line with prior research, most of the informants explained that the business context is changing continuously (Beasley *et al.*, 2018; PwC, 2018). They highlighted the growing influence of the digitalisation of the business environment, and the findings enable us to understand specifically how these changes affect the scope of the IAF. It emerges that digitalisation brings new risks and therefore affects risk priorities and internal audit planning. IT risks, especially cybersecurity threats, have become a critical issue.

Our strategy is mainly oriented towards the digital. We are striking out with a certain speed in the digital channels and we substitute the physical channel with the digital channel with a speed that is impressive. The very important risks for us are IT and cybersecurity. However, we find it difficult to have the relevant competencies to handle all this to stay one step ahead of the criminal organisations. (Informant 3, CAE)

The above quote highlights how the IAF needs to adapt its scope to be able to audit these emerging risks. There is a need to audit new technologies when these are implemented in other departments and when business processes become more digitalised. Indeed, digitalisation of an organisation leads to higher exposure to IT systems dependence and thus to IT risks. These risks could come from inside the organisation – for example, through the mechanical breakdown of an IT system – but they can also come from outside the organisation; for example, from cybercriminals. The General Data Protection Regulation that was enacted in the European Union in May 2018 to legislate data protection has also increased in priority as a key emerging risk. As a consequence, the scope of the IAF is broadening beyond the borders of the organisation itself; it must now consider the emerging risks coming from the business environment.

[New technology] means new processes for the company so, for us, new risks. This is something we need to embed in our audit plan and then make sure that we stay connected with the business to understand what they are going through and also make

sure that we audit the right risks. This is one aspect where new technologies impact the internal audit department. (Informant 18, CAE)

Digitalisation is also associated with a more volatile and rapidly changing environment (Schoemaker *et al.*, 2018). Informants confirmed this trend and explained how it affects their daily work. For one, deadlines are shorter, which requires more agility in internal audit planning.

In the implementation [of the audit plan], I think we're becoming more and more agile with regard to the risks. It goes in line with the business that is evolving faster and faster, and therefore we have to be able to react very quickly on new emerging risks. So, we have this audit plan review every six months rather than every year. It didn't exist two or three years ago; we implemented it because we needed to be much more agile. (Informant 17, CAE)

The meaning of the term 'agility' is twofold. First, it may refer to the time between the risk assessment being conducted and the beginning of the audit engagements. This period needs to be minimised to remain close to the strategic goals of the company, which tend to shift more rapidly in the current business context. Second, agility may refer to the ability of the IAF to adapt the timing of its engagements to react to environmental or strategic shifts by adding, moving or removing internal audit missions.

The fact that there are many changes concerning the activities, the strategy; we sometimes arrive too early because the department is going to change completely... And sometimes, we do not have a clear view of what the project will be because it is not sufficiently advanced. So it requires an adaptation of the planning, otherwise the audit wouldn't have an added value... If I had a shorter time horizon and a larger team, I would have more flexibility to adapt to the business fluctuations. Now, I can adapt to the fluctuations of the business, but I only have five to ten per cent of my planning that allows me to adapt. So I am not as flexible as the business. (Informant 10, CAE)

The informants also highlighted the necessity of having appropriate digital knowledge within the internal audit department. With processes becoming more and more digitalised through the use of new technologies, internal auditors have to possess sufficient digital knowledge to be

able to audit increasingly digitalised business processes and ensure risk mitigation by understanding the whole process and the implications of the use of the new technologies.

We need to audit all different departments and processes within the company. It is our role, and IT and technology is part of that. So, if we need to audit an application in a certain type of technology, we need to understand at least what the technology does... So, we do not need to know and have the technical skills of being able to program artificial intelligence, for example. The most important thing is to understand really what effect it has on your business, on your processes, on your controls... To understand what effect it has and to make sure it does not have any biases that are built in.
(Informant 20, CAE)

The agility and digital knowledge now required from the IAF echo the dynamic capabilities approach, which highlights the importance of being able to adapt managerial and organisational processes to changes in regimes of rapid technological change (Teece *et al.*, 1997). In this volatile and complex business environment, organisations are required to adapt continuously to face these rapid changes (Schoemaker *et al.*, 2018; Teece and Leih, 2016). In this context, internal auditors need to implement agile planning and improve their understanding of the digital environment to face the emerging challenges presented by digitalisation.

Prior research has identified digitalisation as an important influential mechanism for change in organisations (Bharadwaj *et al.*, 2013; Legner *et al.*, 2017; PwC, 2018). In the case of internal audit departments, it seems to shape not only the scope but also the required role of the IAF within the organisation.

Changing role

Given the huge technological challenges that financial institutions are going to face, it is in our interest to have an internal audit function that is much more a partner... Someone beside the business in terms of skills, knowledge, and that helps the business along the way and not solely at the end during the audit... This is what we call peace time versus war time. I think we are in war time because there are many things that are changing, and I think it highlights the importance of the auditor as a consultant.
(Informant 4, Senior management)

Digitalisation appears to modify the expectations of the IAF. Most of the members of the management committees in our sample explained that they would like the IAF to become more of a business partner rather than a controller. Given the digitalisation of the business environment, the senior management would like the IAF to perform more consulting activities to support management in facing emerging technological challenges rather than to adopt the role of a controller that performs only assurance activities. Some of the interviewed internal auditors in our sample also noted that the demand for consulting activities has increased progressively over time. It appears that the senior management tends to expect more consulting activities when the business environment faces a period involving many changes. Both the interviewed members of management committees and internal auditors emphasised that consulting activities tend to add more value to organisations, and it emerges that the rapidly changing business environment accentuates this trend.

However, while members of management committees stated that the IAF should ideally perform more consulting activities, the perceptions of internal auditors appear more nuanced; the views of the informants are more divided on this matter. On the one hand, several informants consider their activities to constitute consultancy when the IAF goes beyond recommendations by helping the business with the resolution of problems but without taking on responsibility for the required changes.

[Consulting] is about best practice, not only verification: I come, I notice what is not working, and I talk to you about an action plan to improve. That is prudential control. Being a coach could be another approach. Look, in my experience, if you do it like this or like that, it will work better, or if you consult this person or that person, it will work better. It is about bringing value, helping the person to improve the service and so on, rather than asking questions and seeing what is not working well. (Informant 6, Senior management)

On the other hand, other informants appear to be torn between their independence and the added value of consulting activities.

This is a mixed approach because the first part is definitely a control mission. It is clear in the minds of the auditors that they are here to control. But again, you can control and say, 'I controlled that and here are the weaknesses that I detected'. Or you can control, make recommendations and determine a timed action with the management and a

follow-up of this action plan. So to me, the first part is definitely control. The second part, when we talk about recommendations and action plans, it is more in a consulting mindset. (Informant 2, Senior management)

This quote highlights how difficult it can be for internal auditors to be conscious of when they are breaching their independence, especially with the increasing demand for consulting activities. This appears to create tensions between the IIA Standards and the demands coming from management. These findings echo the concept of expectation gap, which represents the gap between the requirements of the auditing profession and the tasks that auditors actually perform in their engagements (Chandler and Edwards, 1996; Jedidi and Richard, 2018; Sikka *et al.*, 1998). In this case, a gap appears to be emerging between the requirements of the internal audit profession and the new requirements of the digitalised business environment, which creates tensions for internal auditors. To cope with these tensions, some informants stated a preference for adopting an advisory role that does not imply their responsibility in activities where the IAF is personally responsible. The responsibility criterion appears to be important as most of the informants consider that a definition of consultancy not engaging their responsibility could preserve the independence of the IAF.

We have to be independent... What I can do is sit with you and talk to you about how you are running your operation and give you advice... So, to me, advisory is that I'm giving you a little advice, but you can take it or leave it. Consulting is impacting the organisation a little more directly, which is why we call it advisory and not consulting... It is clear that the person responsible for the work is you, not me. (Informant 15, CAE)

Most of the informants indicated that the organisational strategy has a direct impact on the IAF, and especially on internal audit planning. This planning appears to evolve over time to meet strategic goals. Most of the informants pointed out that the IAF is not, and should not be, involved in the definition of the strategy; this ensures that the IAF maintains its independence. Nevertheless, several informants acknowledged that the IAF could have an indirect impact on the strategy through consulting activities, by leading management to modify or even improve it.

We have an input to bring to the strategy, by the means of the consulting activities, to say 'attention, there are still some elements that must not be forgotten in our strategy, in our map'. (Informant 7, CAE)

The context of digitalisation seems to strengthen this trend to demand more consulting-like activities from the IAF and the expectation for internal auditors to act like business partners that advise the (top) managers in an organisation rather than the IAF acting like a controller.

This section has shown that, in a changing environment, the demand for consulting activities increases and the senior management wants the IAF to be more of a business partner. This change enables internal auditors to have an influence on the organisational strategy, even if in an indirect way. This is in line with prior research highlighting that the IAF is tending to become oriented towards consulting activities again (Soh and Martinov-Bennie, 2011; Stewart and Subramaniam, 2010). However, this change leads to role ambiguity for the IAF and raises objectivity concerns (Lenz and Hahn, 2015; Roussy, 2013; Soh and Martinov-Bennie, 2011). Internal auditors are thus torn between their independence and the added value generated by consulting activities. To cope with these tensions, the results highlight that internal auditors tend to adopt an advisory role, which does not imply any actual responsibility on their part. This type of approach can be considered as a form of resolution strategy (Poole and Van de Ven, 1989; Smith and Lewis, 2011), which refers to individuals trying to find means of addressing tensions to gain an equilibrium (Slotegraaf and Dickson, 2004; Smith and Lewis, 2011). In this case, internal auditors tend to operate a strategy where they accommodate dualities under the label of an ‘advisory role’. The findings described so far highlight how digitalisation affects two dimensions of the IAF: its scope and its role. However, digitalisation also appears to be impacting the working practices of the IAF.

Changing IAF working practices

Informants’ responses highlight that digitalisation impacts internal audit practices. Digital technologies are perceived by internal auditors as a way to improve their working practices significantly. Working practices comprise two main categories: the digital tools that are implemented in internal audit departments, and the individual skills of internal auditors.

When talking about the potential of new technologies that internal audit departments could leverage, most of the informants mentioned data analytics software. Data analytics, as a tool that offers multiple advantages, is seen as the main technology utilised by the IAF to digitalise its working practices. First, our informants pointed out that data analytics allow for increasing the accuracy of analysis. The ability to test full data sets instead of samples makes reports significantly more substantive. During the testing phase, data analytics software is able to detect

all anomalies occurring within a defined period of time, which generates a much higher level of confidence than sampling methods. With sampling, anomalies can sometimes not be detected and, even when they are, it can be difficult to judge the extent to which similar anomalies not included in the sample are present. Analysis of full data sets ensures that the audit approach is more fact-based and increases the statistical relevance of the findings. As a consequence, it increases the value of audit reports for the business because the work of the IAF can show the exact situation.

Some of the informants indicated that data analytics tools are mainly used during the execution phase of testing, while others also mentioned their use during the planning phase, with preliminary analysis on full data sets being used to establish the risk assessment. In this way, processes with a high number of anomalies can be included in the planning and those with no anomalies can be excluded. Prior research highlights the value of developing a risk-based approach over a control-based approach (Allegrini and D'Onza, 2003; Coetzee and Lubbe, 2014; Spira and Page, 2003). Implementing a risk-based approach with the support of data analytics during the risk assessment makes the process more fact-based and, in turn, ensures that the audit is even more focused on riskier areas.

Now, with data analytics tools and methods, we are no longer limited to samples and we can check and analyse the whole population of data. We can say by using these tools on the full population that the number of anomalies is fixed, whereas in the past it was based on a limited sample. So, when you're making your conclusions, it is based on a full population. (Informant 27, Group internal auditor)

Second, some of the informants pointed out that data analytics tools increase the efficiency of the IAF. As stated above, they allow for increasing the scope of analysis while also reducing the effort involved because the system conducts all of the analysis operations. The informants who use data analytics explained how they set up data analytics scripts to launch automatic analyses. Once a script is set, the internal auditor simply launches it and the system processes the analyses automatically. Internal auditors no longer need to extract the raw data, clean the reports, select a sample and test each individual item of the sample themselves. Therefore, the efficiency of the work of internal auditors is increased, which enables them to engage in more focused tasks because they only need to look at the anomalies detected by the system rather than analysing an entire sample that could contain no anomalies.

By using this technology, you are able to look at facts and to process a lot of data with limited efforts. Data analytics enables us to make better and more selected samples. Instead of randomly taking samples, we are in a position where we can say 'look, these are the transactions that potentially are questionable, we can investigate them further'. (Informant 18, CAE)

Third, data analytics tools facilitate not only looking at historical data but also building strong predictive analyses on potential evolutions. This adds a new dimension to the IAF in terms of performing detailed scenario analyses looking forward. Having access to large volumes of data enables auditors to perform in-depth and advanced predictive analyses to understand how anomalies could impact the organisation in the future.

Now, what we could do with the data analytics team is that we could actually take a massive volume of data and really check for certain scenarios of anomalies. (Informant 20, CAE)

Informants use data analytics software to differing levels, but most of them raised the fact that data analytics has become the cornerstone for other digital developments. Technologies such as artificial intelligence and advanced audit practices such as continuous auditing are rarely integrated in internal audit departments (i.e. where most of the informants work). Nevertheless, informants highlighted that, once data analytics scripts are implemented to examine full data sets for a given period of time, more complex scripts could be developed in the future to further automate these tests, allowing for launching tests on a more frequent basis and, eventually, to work towards continuous auditing. Some of the informants went even further, stating that artificial intelligence could be used alongside data analytics scripts to not only generate analyses of full data sets but also perform a first interpretation of the results. Informants stressed the importance of the standardisation and automatisation of internal audit procedures and business processes to leverage the potential of new technologies and pave the way for future digital developments. Although artificial intelligence and continuous auditing practices are not yet integrated in internal audit departments, informants expect developments in this area in the coming years.

I think we will use more and more artificial intelligence [in the future] in terms of machine learning and data analytics plus machine learning. It is inevitable that it will be implemented because machine learning gives the benefits to automatise and to

predict something. I think it will be done in ten years starting from now. (Informant 26, Senior internal auditor)

However, two major constraints appear to come with the implementation of data analytics and more generally regarding the implementation of new technologies: the time required for the first implementation, and the costs of use. Although data analytics tools can increase the accuracy and efficiency of audit procedures, time is required for the initial setup of the software and to make sure that internal auditors start to use it. The second constraint involves costs; both the costs of the use of a system and, mainly, the costs of developing the required skills for internal auditors. Digital skills are considered by most of the informants as the primary barrier for adopting data analytics technologies. These obstacles to the use of data analytics systems echo the dimensions of the technology acceptance model – perceived usefulness and perceived ease of use (Davis, 1989; Venkatesh and Bala, 2008). Perceived usefulness represents ‘the extent to which a person believes that using an information technology will enhance his or her job performance’ and perceived ease of use refers to the ‘degree to which a person believes that using an information technology will be free of effort’ (Venkatesh and Bala, 2008, p. 275). Internal auditors appear to perceive the usefulness of data analytics and to understand that such technologies offer them opportunities in their daily work. However, using such technologies still appears effortful for the IAF. Data analytics systems imply costs, especially in terms of the skills required to use such technology.

In our department, there are two people who are specialised in data analytics... We try to have reports that are substantive and incontestable... We are able to make analyses that few departments are able to make, either because they do not have the competencies or because they do not have access to all the data. We have access to it all, including all the systems. (Informant 1, CAE)

Digital skills are becoming crucial in internal audit departments. This does not refer specifically to IT skills for the auditing of IT systems and IT architectures, but to skills in a broader sense of having an affinity for new technologies. Thus, it implies that a certain level of digital awareness is required in every internal auditor for them to understand, on the one hand, how new technologies work and impact increasingly digitalised business processes, and on the other hand, how they can help to improve internal audit working practices.

I think that we will evolve more and more to what we call hybrid auditors, meaning business auditors who are people who have the knowledge, who have an experience in the business activities that they audit and, at the same time, also a strong knowledge of digital processes of IT processes. Not pure IT auditors but a mix of business auditor and IT auditor. I think that more and more we will evolve to having these profiles within our departments. (Informant 27, Group internal auditor)

Informants discussed different strategies for increasing the level of digital expertise inside their departments. Recruiting internal auditors is one solution, with some respondents indicating that the priorities in terms of recruitment have also evolved. They tend to hire more people with digital skills rather than people with purely financial skills in their departments to meet requirements.

We try to hire fewer and fewer staff with financial skills. We would rather hire people who are industrial engineers, informatics engineers because in parallel we are putting in place programs to do data mining. (Informant 13, CAE)

Alongside recruitment, some internal departments are focusing more on training. However, they explain that it can take time for employees to gain expertise. A lack of internal expertise can lead internal audit departments to outsource some elements of their audit activities related to IT and data analytics. These results echo recent studies suggesting that the use of data analytics is still not standard practice within internal audit departments and that internal auditors make only basic use of data analytics tools during their engagements (IIA, 2018, 2019).

For the IT part, next year I will seek the help of external consultants, who will perform IT audits for me and I will check [their work], because we do not have the skills internally in IT auditing. (Informant 10, CAE)

Discussion

In the analysis presented above, we investigated how internal audit is evolving in an increasingly digitalised environment. The analysis of the results did not reveal any differences between the financial and non-financial sectors; therefore, the evolutions appear to apply in a transversal manner. This paper contributes to the literature on the IAF in three ways.

First, this study helps to better appraise how digitalisation has changed the scope of the IAF. As an internal organisational process, internal audit departments are adapting to remain dynamic and reconfigure their way of working in order to face the rapid changes induced by the digitalisation of the environment. The findings reveal two ways in which the IAF could develop to continue to bring value to organisations – agility and digital knowledge. First, an agile internal audit planning is observed as an important value lever in the digitalised environment. In our context, agility can be seen at two levels: (i) reducing the time between the risk assessment and the beginning of audit engagements; and (ii) having the capacity to include ‘surprise’ engagements during the year based on strategic changes induced by the digitalisation of the environment. From this perspective, the IAF can remain aligned to the reality of the business, which reduces the likelihood of performing out-of-scope missions or failing to perform important ones. Alongside an increasing demand for agile planning, internal auditors are also required to have a good understanding of the digital business environment and to improve their digital knowledge to face the risks that digitalisation presents. Actual internal auditing involves auditing processes that are integrating new technologies, which requires a certain level of digital expertise for internal auditors to be able to perform their missions. The ability for the IAF to adapt in the digitalised business environment can be considered in light of the dynamic capabilities approach, which stresses the importance of adapting processes to face the challenges induced by rapid technological changes (Teece *et al.*, 1997).

Second, this study helps to better understand how digitalisation has changed the role of the IAF. Digitalisation appears to have created a new expectation from senior management for internal audit departments to act much more as business partners and less as controllers. This demand for consulting activities appears to be increasing in the changing digitalised business environment. The results show that an IAF performing more consulting activities can be perceived as more valuable and can lead senior management to modify the organisational strategy. As a result, the IAF appears to have the potential to be more impactful and valuable for organisations. An internal audit department benefits from a privileged position within a company: it is internal to the organisation, but it is not directly under the supervision of the top levels of management; rather, it reports to the audit committee. Moreover, the IAF has access to all the systems inside the organisation and has a comprehensive overview of operations. The position of the IAF in the organisational chart, connecting with senior management but reporting to the board, presents an opportunity to bring value in terms of strategic risks – acting as a guide inside the organisation when it is facing new situations (Roussy, 2013) can bring

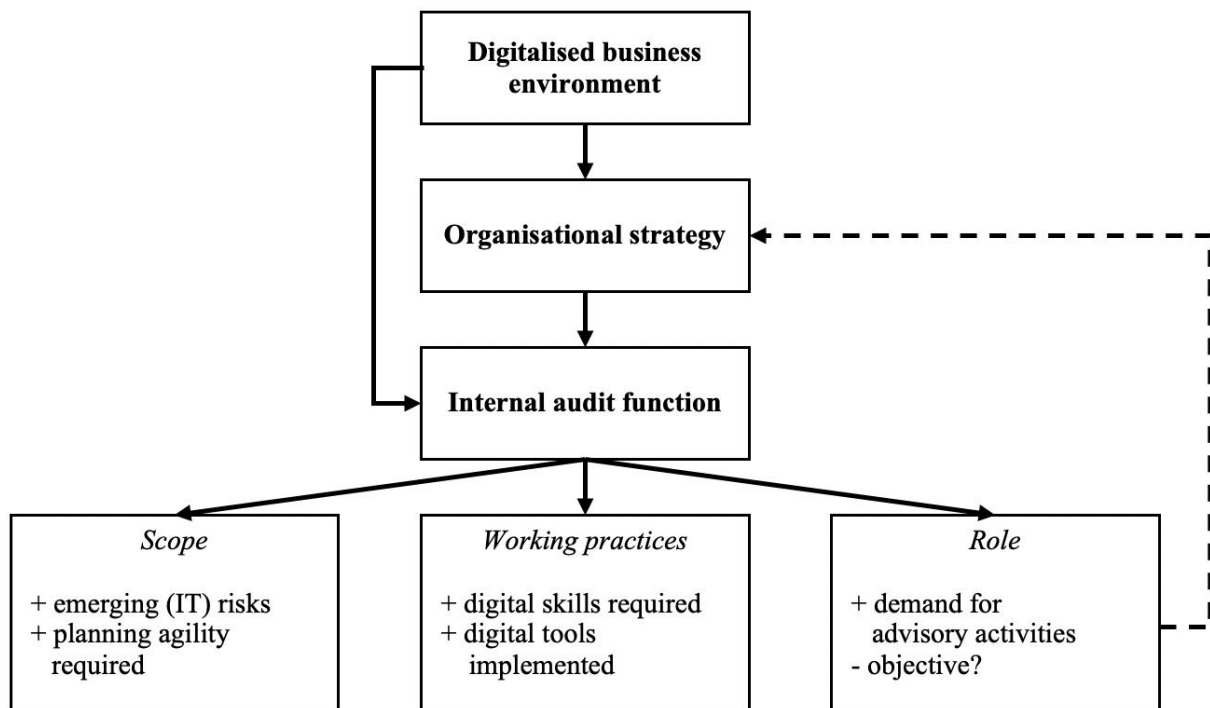
significant value. Nevertheless, performing consulting activities appears to create tensions for some internal auditors who are torn between maintaining their independence and the added value generated by carrying out consulting activities. Digitalisation of the business environment appears to have accentuated this trend towards consulting activities. In turn, it also increases objectivity issues (Lenz and Hahn, 2015; Roussy, 2013). It highlights the expectation gap (Chandler and Edwards, 1996; Jedidi and Richard, 2018; Sikka *et al.*, 1998) between the requirements in terms of objectivity and independence of the IAF on the one hand and the expectations of the business to provide better support in terms of facing emerging risks on the other. To manage these tensions, many internal auditors appear to adopt a form of resolution strategy (Poole and Van de Ven, 1989; Smith and Lewis, 2011) by finding a way of addressing such tensions to gain an equilibrium (Slotegraaf and Dickson, 2004; Smith and Lewis, 2011). Internal auditors tend to describe their role as an ‘advisory role’ to avoid taking on direct responsibility.

Finally, we bring a deeper understanding about how internal audit departments are reconfiguring their ways of working in the current digitalised business environment. The findings highlight the potential of new technologies for supporting the IAF in its day-to-day missions. Among the range of new technologies available, data analytics tools have been identified as those that internal audit departments are primarily beginning to focus on. They offer opportunities for internal auditors to increase the accuracy and efficiency of their work by automatically testing full data sets. This makes the audit approach significantly more fact-based compared to traditional sampling methods. However, to benefit from these technologies in their daily work, internal auditors must have the appropriate digital skills. In this context, we thus observe a switch of focus from financial skills towards digital expertise. Internal audit departments are moving towards attracting digital profiles rather than financial or accounting professionals to meet these new requirements. The existing literature highlights the advantages of having in-house internal auditors, suggesting that they have more expertise and familiarity with the organisation’s business processes and risks (Abdolmohammadi, 2013; Roussy and Perron, 2018). However, internal audit departments are still struggling to attract and find suitable digital profiles internally due to the barriers presented by data analytics and the use of new technologies. Although internal auditors appear to perceive the usefulness of data analytics, using such technologies still appears effortful for the IAF (Venkatesh and Bala, 2008). Implementing data analytics implies costs, especially in terms of the skills required to use such technology. These barriers to the adoption of data analytics technologies explain why

internal audit departments are still outsourcing activities related to digital operations.

Figure 3 presents a conceptual model summarising the key influences of the digitalisation of the business environment on the IAF.

Figure 3: A conceptual model summarising the research findings



The managerial implications of this paper are threefold.

First, the findings indicate the importance of internal auditors having an agile approach to audit planning to ensure that they conduct missions aligned to strategic shifts. To remain agile, the IAF could allocate a certain number of buffer days dedicated to ‘surprise’ audit missions or shifts in planning. Moreover, continuous contact with the managers of the different business lines at all stages of the audit missions could enable the IAF to stay connected to business changes and anticipate future shifts in internal audit planning. Finally, reducing the time between conducting the risk assessment and validating the planning appears to be a key factor in developing relevant missions.

Second, the digitalisation of the business environment is inducing changes in the required skills expected within an internal audit department – a switch in priorities between financial skills and IT skills has been observed. The latter are becoming increasingly important for the IAF to

remain aligned to the business context and the organisational strategy. Specifically, there is an increasing trend towards the use of data analytics in internal audit missions. Data analytics technologies offer internal auditors opportunities to bring more value to their company due to the broader and more precise scope of analysis they afford during internal audit tasks. Developing the use of analytics is becoming key for digitalised organisations to gain a competitive advantage (Kiron *et al.*, 2012). Additionally, data analytics offer internal auditors the opportunity to extract data directly from the relevant sources themselves, thus making them less dependent on management reports. Therefore, internal audit departments could attend training sessions to develop their skills in data analytics and hire individuals with profiles that enable them to benefit from the opportunities of such technologies. Developing the IT skills of the internal audit department appears to provide an opportunity to increase the value and credibility of the IAF. Obtaining these skills is particularly important in a context where many internal audit departments are still struggling with IT risks and outsourcing internal audit activities related to IT. Such changes could also help them to reduce the outsourcing of digital processes and activities.

Finally, senior management has to deal with a changing business environment. As business partners, internal auditors should develop a mindset that is more oriented towards consultancy or advisory roles to guide organisations regarding strategic changes. Internal audit departments should highlight their added value to auditees and senior management to more easily gain a better understanding of the reality of the business and to ensure that they add value to organisations. However, this trend represents a challenge for internal auditors in terms of maintaining their independence and objectivity. Therefore, it is important to achieve a suitable balance between maintaining internal auditors' independence and generating added value through providing advisory and consulting services.

Future research

This research has gathered the opinions of members of management committees and CAEs. Future research should investigate the perceptions of members of audit committees or auditees, especially in relation to the consulting and advisory activities performed by the IAF. The findings highlight that the IAF is increasingly required to perform consulting activities to bring more value to organisations. Future research gathering the views of these stakeholders could provide additional perspectives (Trotman and Duncan, 2018) on the type and nature of

consulting activities that the IAF could perform to be perceived as valuable to organisations in the current digitalised business environment.

Future research should also investigate the views of external consultants specialising in internal audit processes. All the auditors interviewed in this research are in-house internal auditors. Having the opinions of external auditors could provide additional information, especially in terms of the context where the IAF is expected to provide more consulting activities. These stakeholders could express opinions on the IAF that differ from those of internal auditors, and they could have a different view from top management regarding the matter of independence (Trotman and Duncan, 2018).

Future research should investigate the relationship between the level of digital transformation of organisations and the needed profiles of their internal audit department in terms of skills, role and scope to help evolve the training of internal auditors to meet organisational expectations.

Finally, this research was conducted in the European Union, where the General Data Protection Regulation was recently enacted to legislate the use and protection of consumers' data. Future research could investigate other legal contexts where this regulation does not apply.

Chapter 2: Effects of digitalisation of organisations on internal audit activities and practices

Nathanaël Betti, Gerrit Sarens and Ingrid Poncin

Introduction

Over recent decades, the business environment has increasingly become digitalised (Beasley *et al.*, 2018). New technologies arrive on the market continuously and are integrated into every aspect of private and business lives. Digital technologies cause changes in consumer behaviour (Kannan and Li, 2017; Verhoef *et al.*, 2021), forcing organisations to adapt their way of doing things. Organisations are altering their business models, leading to changes in their strategy, IT, marketing and supply chains by integrating increasingly digital technologies (Verhoef *et al.*, 2021). Data analytics and artificial intelligence are examples of new technologies that organisations are or will be integrating in the future (PwC, 2018).

The digitalisation of the business environment and the growing use of digital technologies facilitate the standardisation of business processes (Ardolino *et al.*, 2018; Green *et al.*, 2018; Kokina and Blanchette, 2019; Troshani *et al.*, 2019) and the uptake of competitive advantages for organisations (McKinsey, 2016). However, digitalisation also brings challenges and risks for organisations (Craigien *et al.*, 2014; ECIIA, 2019). Digitalisation is associated with high levels of volatility, uncertainty, complexity and ambiguity (Schoemaker *et al.*, 2018) and induces emerging risks that the internal audit function (IAF) helps to manage. From this perspective, the IAF has a role to play in helping organisations face these emerging risks.

Over the years, the IAF has evolved to meet the requirements of the changing business environment (Castanheira *et al.*, 2010; Soh and Martinov-Bennie, 2011) and its involvement in consulting activities is highly debated in the literature (Soh and Martinov-Bennie, 2015; Spira and Page, 2003; Stewart and Subramaniam, 2010). Even though their involvement was consequential before the financial scandals and economic crisis of the 2000s, the role of the IAF has changed and has refocused its scope towards assurance activities (Hass *et al.*, 2006; Hermanson, 2002). Furthermore, the literature points out the importance of the IAF being closer to strategic risks (Allegrini and D'Onza, 2003). Industry 4.0 (Bloem *et al.*, 2014) appears to

require modifications to the activities that the IAF has conducted in past years, however. The rapid growth of digitalisation raises questions about the role of the IAF in this changing environment. According to PwC (2018), its function should evolve and integrate new technologies and digital knowledge. From this perspective, the IAF could bring more value to organisations by helping them face the risks related to digitalisation (Coleman *et al.*, 2018) and to lever the advantages of such technologies in their internal audit missions (PwC, 2018).

Although digitalisation has become a critical topic for the IAF in recent years (ECIIA, 2019; IIA, 2019), it appears that the IAF does not always align its activities and its role with the digitalisation of the business environment. Digital expertise has become critical for internal auditors, but departments are lacking these kinds of skills (IIA, 2018, 2019). Organisations still ask for the expertise of external service providers to mitigate the lack of digital skills in internal audit departments. In the current digitalised context, the IAF should build its activities around IT and digital challenges. Furthermore, digitalisation also represents an opportunity for the IAF to evolve. Digital tools offer multiple possibilities for the IAF to improve its way of working. Data analytics or artificial intelligence are examples of digital tools that the IAF could utilise. Recent reports indicate that high performing internal audit departments are using these kinds of technologies. However, they also indicate that internal audit departments do not use new technologies enough, despite their adoption in other departments (Deloitte, 2018; PwC, 2018, 2019).

Prior research has investigated the digitalisation of organisations outside the internal audit field (Beasley *et al.*, 2018; Kane *et al.*, 2016; Verhoef *et al.*, 2021). However, while prior literature stresses the importance of the IAF broadening its scope to strategic IT issues (D'Onza *et al.*, 2015b; Soh and Martinov-Bennie, 2011, 2015), there is still limited knowledge about the evolution of the IAF's activities and practices in a digitalised business environment (Roussy and Perron, 2018). The IAF could be significantly different from one organisation to another (Allegrini and D'Onza, 2003; Sarens and De Beelde, 2006). Although the IAF could have a broad role inside an organisation, the drawback is that the IAF is often perceived as a 'jack of all trades, master of none' (Roussy and Perron, 2018, p. 347). Consequently, the IAF must adapt its way of working, especially in a continuously changing digitalised environment. The IAF should, therefore, reconfigure itself and adapt its practices to continue to provide value to organisations, especially in an increasingly digitalised context (Teece *et al.*, 1997).

This research intends to investigate how the IAF operates in a digitalised environment.

Specifically, we aim to investigate how the IAF modifies its activities and practices in relation to the organisation's level of digitalisation at two levels: the kind of activities performed by the IAF and the use of data analytics by internal auditors.

Our results are twofold. First, we find a positive relation between the organisation's level of digitalisation and the use of data analytics by internal auditors during their missions. Second, we find that the organisation's level of digitalisation has an indirect effect on the proportion of the internal audit planning dedicated to consulting activities, the use of data analytics by internal auditors mediating the relationship between the organisation's level of digitalisation and the proportion of the internal audit planning dedicated to consulting activities.

Our paper is organised as follows. First, we present the theoretical backgrounds of digitalisation and the IAF. Then, we detail the methodology used and present the results. Finally, we discuss our theoretical and managerial contributions and present the limitations of the study and avenues for future research.

Background and hypotheses

The digitalisation of the environment

We often confuse 'digitisation' and 'digitalisation'. 'Digitisation' refers to the 'technical process of converting analog signals into a digital form, and ultimately into binary digits' (Legner *et al.*, 2017, p. 301). 'Digitalisation' is defined as 'the manifold sociotechnical phenomena and processes of adopting and using these technologies in broader individual, organisational, and societal contexts' (Legner *et al.*, 2017, p. 301) and specifically relates to the way these technologies alter existing business processes (Verhoef *et al.*, 2021). Therefore, the technical process of digitisation concerns only one portion of digitalisation. Indeed, digitalisation refers to the pervasive use and broad development of technologies in organisations and society (Bloem *et al.*, 2014).

Contrary to popular belief, the digitalisation of the business environment is not a new phenomenon. Society has already faced several waves of digitalisation (Legner *et al.*, 2017). The first wave comprises the use of computers and the progressive replacement of paper. The second wave begins with the emergence and use of the internet. The current wave concerns SMACi technologies (social, mobile, analytics, cloud computing and the internet of things) and refers to continued miniaturisation, increased processing power and expanded communication

bandwidth (Legner *et al.*, 2017). Also known as Industry 4.0 (Bloem *et al.*, 2014), this third wave of digitalisation is characterised by the presence of technologies in every aspect of private and professional lives (IDC, 2018) with the result that the business environment is increasingly digitalised (Al-Htaybat and von Alberti-Alhtaybat, 2017; H  roux and Fortin, 2013). New technologies emerge in the market every day and continuously reshape the environment, for instance, the introduction of cyber-physical systems such as smart objects (Stearns, 2013). Digitalisation is also associated with a more volatile, uncertain, complex and ambiguous environment (Schoemaker *et al.*, 2018). SMACi technologies are increasingly present in the business environment and are reshaping it, which forces organisations to adapt and progressively digitalise themselves in order to survive. Moreover, the development and use of digital technologies involve technical changes and a certain level of digital capabilities (Kane *et al.*, 2016), that increase the complexity of the phenomenon.

Digitalisation involves an array of changes for organisational processes and tasks (Verhoef *et al.*, 2021) leading to business processes that are more digitised and automated (Bouwman *et al.*, 2018; Brennen and Kreiss, 2016; Canning *et al.*, 2018; Tschakert *et al.*, 2016). Considering digitalisation only as advanced digitisation is not enough (Ross, 2017; Unruh and Kiron, 2017). Investing in new technologies and their technical aspects is a necessary, but insufficient, condition (Parviainen *et al.*, 2017). Organisations also tend to orient their strategy towards digital aspects (Bouwman *et al.*, 2018; Canning *et al.*, 2018; Tschakert *et al.*, 2016), which notably, includes offering digital services and the transformation of physical channels into digital channels. Including digital in an organisation's strategy is the cornerstone of digitalisation and is a change that requires continuous organisational development. As technologies rapidly change, organisations also make an ongoing effort to discover new digital solutions to improve their business processes and take advantage of emerging digital technologies to further their digital development (Laudien and Pesch, 2019; Parviainen *et al.*, 2017). Consequently, the digitalisation of organisations implies the development of digital resources and an agile organisational structure (Gupta *et al.*, 2020; Verhoef *et al.*, 2021). Employees need to adapt their working habits and integrate digital technologies into their daily professional lives (Kane *et al.*, 2015). As a result, 'digitalisation' refers to the willingness of organisations to implement digital technologies in their strategy and processes. They are, however, challenged by their ability to implement such technologies.

The digitalisation of organisations impacts departments directly involved in the value chain. For instance, the development, production and distribution of new digital goods or services will directly impact research and development departments as well as supply chain divisions. However, the digitalisation of other areas, such as the internal audit department, can be delayed (Wang and Cuthbertson, 2015). Recent reports indicate that IAFs do not exploit the potential of new technologies and that there is much room for improvement. For example, the use of data analytics for the IAF is not yet standard (IIA, 2018, 2019). Prior research has primarily studied the evolution of the IAF from the perspective of institutional pressures, such as normative, coercive and mimetic forces (DiMaggio and Powell, 1983). However, the importance of environmental changes, such as the technological context, has been underexplored (Lenz and Hahn, 2015). This research, therefore, aims to investigate the effect of the digitalisation of organisations on the IAF, especially on its role and working practices.

Internal audit function and data analytics

In a competitive environment, organisations consider digital technologies and the methods derived from them as sources of competitive advantage and as a means to increase profit margins (Accenture, 2014; LaValle *et al.*, 2011; Tschakert *et al.*, 2016). Technologies such as data analytics enable them to automate and facilitate day-to-day work (Legner *et al.*, 2017). Data analytics are defined as ‘the use of data, information technology, statistical analysis, quantitative methods, and mathematical or computer-based models to help managers gain improved insight about their operations, and make better, fact-based decisions’ (Davenport and Harris, 2007, p. 7). Specifically, organisations use such methods to analyse large, unstructured sets of data and to perform advanced analyses (Rickett, 2016; Tschakert *et al.*, 2016) that enable them to evaluate past events and predict future events (Al-Htaybat and von Alberti-Alhtaybat, 2017) with the goal of improving decision-making processes (Gandomi and Haider, 2015; Rickett, 2016).

Recent reports indicate that internal auditors have begun to embrace new technologies, such as data analytics, to automate internal audit practices (Deloitte, 2018; PwC, 2018, 2019). When talking about data analytics for the audit function, the American Institute of Certified Public Accountants refers to ‘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). Although the use of data analytics is expanding in internal audit

departments, the IAF still struggles to harness its full potential (Deloitte, 2018; PwC, 2018, 2019). However, the literature suggests that using this technology could bring accuracy and productivity value to the audit function (Wang and Cuthbertson, 2015). Data analytics could, for instance, support internal auditors throughout their missions during the risk assessment and testing phases by processing higher volumes of data and performing continuous auditing (Tschakert *et al.*, 2016). Such a method could facilitate predictive or prescriptive analyses based on historical data and provide more precise insights and recommendations (Al-Htaybat and von Alberti-Alhtaybat, 2017; Lee *et al.*, 2014; Tschakert *et al.*, 2016). Although internal auditors tend to make limited use of technologies (Wang and Cuthbertson, 2015), we nevertheless posit that the level of digitalisation of the organisation as a whole will influence the use of data analytics by internal auditors. Because digitalisation involves departments adapting and integrating digital technologies into their daily work (Kane *et al.*, 2015), we posit that the more an organisation is digitalised, the more its IAF will tend to use data analytics in its missions. Thus, we hypothesise:

H1: There is a positive relation between the organisation's level of digitalisation and the percentage of use of data analytics by the internal audit function.

In addition to changing working practices, the digitalisation of the organisation can change the role of the IAF.

Internal audit role

The role of the IAF has progressively changed in recent decades. Although the activities of the internal audit have remained within the scope of finance and accounting (Cooper *et al.*, 1994; Gupta and Ray, 1992), they were expanded in the 1990s to include the management area (Jin'e and Dunjia, 1997). The role of the IAF has thus evolved accordingly. Beyond assurance activities, internal auditors began to embrace a consulting role that provides consulting activities for management (Hermanson, 2002; Krogstad *et al.*, 1999). However, the periods following US scandals and crisis in the 2000s have reshaped the activities performed by the IAF. The implementation of regulations to prevent future risks (i.e. the Sarbanes-Oxley Act in the US and the Turnbull Report in the UK) has led the IAF to refocus on assurance activities with internal controls rather than on consulting activities. In the 2010s, the question was raised of increasing consulting activities to provide management with relevant feedback about processes beyond simply controlling them (Chambers and Odar, 2015). In this period,

consulting activities increased and focused on business-improvement processes and efficiencies (Soh and Martinov-Bennie, 2011; Stewart and Subramaniam, 2010).

Digitalisation raises questions about the evolution of internal audit activities, which comes with a certain degree of complexity and uncertainty for organisations (Schoemaker *et al.*, 2018). The digitalisation of the business environment makes business processes more complex (Nuijten *et al.*, 2015) and people are increasingly using digital devices, networks and cloud computing (Kahyaoglu and Caliyurt, 2018). This environment, where big data are continuously generated and new technologies constantly emerge, is increasingly interconnected with organisational systems (Appelbaum *et al.*, 2017; Flora and Rai, 2015). These changes generate new risks for organisations that need, for instance, to prevent IT breaches, intrusions and breakdowns (Appelbaum *et al.*, 2017; Deloitte, 2017; Flora and Rai, 2015; Kotb *et al.*, 2014). Therefore, one could expect that IAF would perform more assurance activities related to these emergent and complex risks, especially IT and cybersecurity risks. Nevertheless, the follow-on complexity of digitalisation could lead organisations to ask for more guidance from the IAF (Roussy, 2013). For example, internal auditors could play a more proactive role in the early stages of implementing new IT developments (Kahyaoglu and Caliyurt, 2018) or when implementing new technologies (Flora and Rai, 2015). Internal auditors could also provide advice and insight on cybersecurity programmes and risk prevention (Dixon and Singer, 2011; Kahyaoglu and Caliyurt, 2018), thereby performing more consulting activities. As a result, we believe that digitalisation will lead to internal auditors shifting to a greater consulting role. We, therefore, posit that the demand for consulting activities will increase with the organisation's level of digitalisation and hypothesise:

H2: There is a positive relation between the organisation's level of digitalisation and the percentage of consulting activities performed by the internal audit function.

The use of data analytics in internal audit missions may also change the role of internal auditors. The use of data analytics could standardise practices and increase the efficiency of work (Kidron *et al.*, 2016; Warren *et al.*, 2015). As a result, the IAF could redirect its taskforce to other projects such as consulting activities (PwC, 2018). From this perspective, we hypothesise:

H3: The percentage of use of data analytics by the internal audit function mediates the relationship between the organisation's level of digitalisation and the percentage of consulting activities performed by the internal audit function.

Methodology

Data collection

To test the hypotheses, we conducted an online survey (i.e. D’Onza and Sarens, 2018; Gros *et al.*, 2017). Data was collected in collaboration with the Global Institute of Internal Auditors (IIA). In mid-November 2017, the IIA sent its first email to members of the institute in the US containing a link to the online survey. They sent a reminder email two weeks later. The survey was submitted to a total of 5,922 chief audit executives. We obtained answers from 160 respondents; a response rate of 2.7%. In light of recent studies using internal audit surveys, this response rate seems quite reasonable (D’Onza and Sarens, 2018; Gros *et al.*, 2017). However, we excluded 78 answers due to missing data. The final sample was thus composed of 82 respondents at an adjusted response rate of 1.4%. Organisations from the financial and non-financial sector were included in the sample. We were not able to test the non-response bias. Since the demographic questions were at the end of the survey, we were not able to collect the IAF sizes and sectors of the respondents who did not complete the survey. As a result, this study may suffer from non-response bias (Gros *et al.*, 2017). Nevertheless, we compared the responses between respondents who completed the survey after the first email and those who completed it after the reminder sent two weeks later (D’Onza and Sarens, 2018; DiGabriele, 2016; Svanberg *et al.*, 2018). We found no significant difference between the early and later responses.

Measures

We measured the organisation’s level of digitalisation in which the respondents worked with a four-item scale: (1) the organisation follows a strategy mainly based on digital developments; (2) the business processes are digitised and automated; (3) the organisation first thinks about digital solutions to improve business processes; (4) the organisation fully uses digital solutions available on the market. These items were measured on five-point Likert scales. Table II presents the scores for each item.

Table II: Scores of each item included in the DIGITAL variable

Items DIGITAL	N	1	2	3	4	5	Mean	SD
The organisation follows a strategy mainly based on digital developments.	82	7	30	24	17	4	2.77	1.034
The business processes are digitised and automated.	82	6	20	24	29	3	3.04	1.024
The organisation first thinks about digital solutions to improve business processes.	82	0	18	27	32	5	3.29	0.882
The organisation fully uses digital solutions available on the market.	82	3	36	22	18	3	2.78	0.956

Using the principal component analysis (PCA), we grouped these four items under one factor. The Cronbach's alpha of this ad hoc scale was above the critical value of 0.7 (score = 0.781), and the percentage of the explained variance was 60.584%. Consequently, we could group these four items under one factor describing 'the organisation's level of digitalisation', named DIGITAL. To compute this new variable, we averaged the four scores. Table III presents the results of the PCA analysis.

Table III: Results of the PCA

	# of items	KMO index	Bartlett test	% Explained variance	Cronbach's alpha
Organisation's level of digitalisation	4	0.784	Khi ² : 84.311 ddl: 6 p-value: 0.000***	60.584%	0.781

*** Significant at the 0.01 level (two-tailed)

We assessed the use of data analytics by asking the respondents to indicate the percentage of the planning for which the internal audit department uses data analytics in its missions. We also measured the performance of consulting activities by asking respondents to indicate the percentage of the internal audit planning dedicated to assurance and consulting activities, stating that the total should be equal to 100%.

Finally, we controlled for the sector and size of the IAF. The financial sector is highly regulated, which can influence the activities performed by the IAF (Gras-Gil *et al.*, 2012; Koutoupis and Tsamis, 2009; Naheem, 2016). The sector in which organisations operate was, therefore, included as a control variable. We asked the respondents to indicate the sector of the organisation in which they worked. Then, we created a dummy variable (0 = non-financial

sector; 1 = financial sector) based on the Standard Industrial Classification (SIC) codes. Moreover, the size of the internal audit department can also influence the activities performed by the IAF (Rönkkö *et al.*, 2018; Sarens and Abdolmohammadi, 2011; Sarens *et al.*, 2012). The size of the internal audit department was thus also included as a control variable. To assess this variable, we asked the respondents how many full-time equivalent employees worked in the internal audit department. Table IV presents the variables used during the analyses.

Table IV: Description of the variables

Variables	Definition	Measurement
DIGITAL	Organisation's level of digitalisation	Variable with a value between 1 (low level of digitalisation) and 5 (high level of digitalisation)
CONSUL	Performance of consulting activities	Percentage of the internal audit planning dedicated to consulting activities
DATA_AN	Use of data analytics	Percentage of the planning for which the internal audit department uses data analytics in its missions
IAFSIZE	Size of the IAF	Number of full-time equivalent employees working in the internal audit department
SECTOR	Sector of the organisation	Dummy variable with a value of 0 (organisation from the non-financial sector) or 1 (organisation from the financial sector)

Results

Descriptive results

Table V and Table VI show the descriptive characteristics of the variables.

Table V: Descriptive statistics of continuous variables

Variables	N	Mean	SD	Min.	Max.
CONSUL	82	26.68	16.722	0	90
DATA_AN	82	19.74	18.927	0	90
IAFSIZE	82	17.87	71.780	1	650
DIGITAL	82	2.97	0.758	1.5	4.25

Table VI: Descriptive statistics of dichotomic variables

Variables	N	Groups	N	%
SECTOR	82	Non-financial sector	41	50%
		Financial sector	41	50%

We first observed that the average percentage of consulting activities is 26.68%. However, the standard deviation (16.722) indicates that the percentage of consulting activities varies between organisations. Second, the average use of data analytics during internal audit missions was quite low. On average, data analytics were used in less than 20% of these organisations during internal audit engagements. Given the current technological developments and the emphasis highlighted in the literature (Bouwman *et al.*, 2018; Canning *et al.*, 2018; Tschakert *et al.*, 2016), we had expected a higher percentage. It shows that the use of data analytics in the internal audit profession is still not standard and that there is room for improvement, as highlighted in recent reports (IIA, 2018, 2019). Third, the average score of the DIGITAL variable is 2.97, which is very close to the neutral score. 38 respondents presented a DIGITAL score below the average and 44 above it. 30 respondents had a DIGITAL score equal to or above 3.5. This means that only a third of the respondents considered their organisation to be digitalised in at least 2 aspects out of the 4 that formed the DIGITAL variable. Finally, it is evident that there is a good representation of sectors in the sample.

Table VII and Table VIII highlight the percentages of consulting activities and data analytics by sub-groups. We performed a t-test between two groups for each variable. For the continuous variables, we made a comparison between the average strictly below the median and the average equal to or above the median. The median for the IAFSIZE variable is 5 and for DIGITAL it is 3. It is evident that the IAF uses more data analytics in their missions in more digitalised organisations. This shows an initial link between the organisation's level of digitalisation and the use of data analytics by the IAF. This relation will be further discussed in other analyses. Also, results indicate that the percentage of consulting activities is higher in smaller IAFs.

Table VII: Percentage of consulting activities by sub-groups

Variables	Groups	N	Mean	SD	t-test	Sig.
SECTOR	Non-financial sector	41	28.05	14.827	0.738	0.231
	Financial sector	41	25.32	18.509		
IAFSIZE	Size < median	35	30.03	16.272	-1.578	0.059*
	Size >= median	47	24.19	16.787		
DIGITAL	Digital < median	38	23.55	13.846	1.624	0.054*
	Digital >= median	44	29.39	18.591		

* Significant at the 0.1 level (one-tailed)

Table VIII: Percentage of data analytics by sub-groups

Variables	Groups	N	Mean	SD	t-test	Sig.
SECTOR	Non-financial sector	41	21.56	22.829	0.868	0.194
	Financial sector	41	17.93	14.052		
IAFSIZE	Size IAF < median	35	20.17	19.730	-0.175	0.430
	Size IAF >= median	47	19.43	18.515		
DIGITAL	Digital < median	38	15.63	15.744	1.856	0.033**
	Digital >= median	44	23.30	20.824		

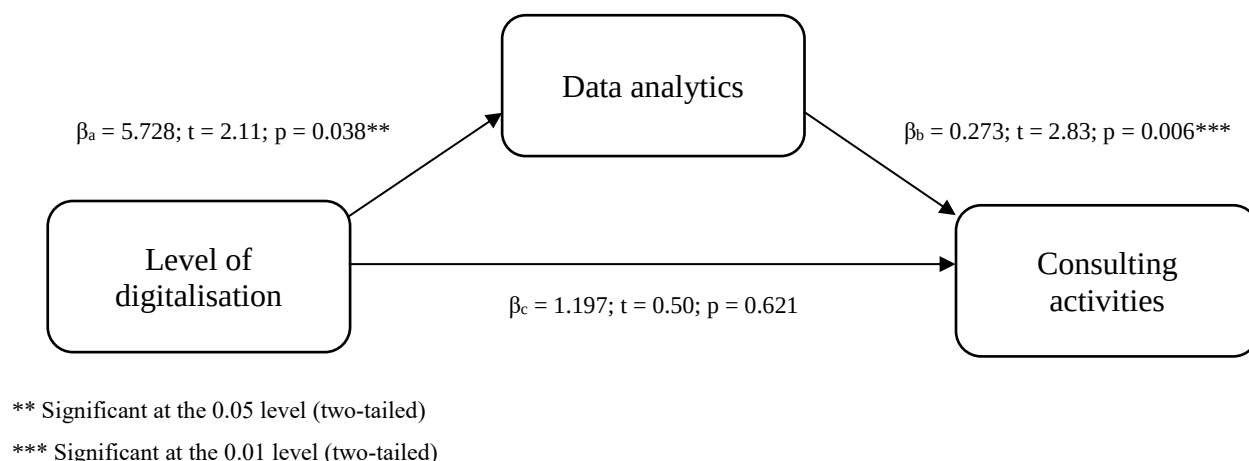
** Significant at the 0.05 level (one-tailed)

Test of hypotheses

To test the effect of digitalisation on the performance of consulting activities and the mediating role of data analytics in the relationship between digitalisation and consulting activities, we used the macro process by Hayes (2017) (model 4; bootstrapped samples = 5,000). The results show that the organisation's level of digitalisation had a significant and positive effect on the use of data analytics ($\beta_a = 5.728$; $t = 2.11$; $p = 0.038$). The effect of the use of data analytics on the performance of consulting activities was also significant and positive ($\beta_b = 0.273$; $t = 2.83$; $p = 0.006$). The direct effect of the organisation's level of digitalisation on the performance of consulting activities was non-significant ($\beta_c = 1.197$; $t = 0.50$; $p = 0.621$). Finally, the indirect effect of the organisation's level of digitalisation on the performance of consulting activities through the use of data analytics, was significant and positive ($\beta_a * \beta_b = 1.562$; 95% confidence interval based on 5,000 iterations: [0.028; 3.906]). However, the direct effect of the organisation's level of digitalisation on the performance of consulting activities was non-significant when the mediator was included in the model ($\beta_c = 1.197$; 95% confidence interval

based on 5,000 iterations: [-3.602; 5.996]). This result indicates a full mediation (Zhao *et al.*, 2010). Consequently, H1 and H3 are supported. Figure 4 summarises the results.

Figure 4: Results



In a subsequent analysis, the potential effects of the sector and the size of the internal audit department were tested by including these variables as covariates. No significant effects were observed.

Discussion and conclusion

Digitalisation is increasingly impacting organisations and changing working practices. However, we have limited knowledge about how digitalisation influences IAF activities and practices (Roussy and Perron, 2018). In this research, we investigated how the IAF modifies its activities and practices in relation to the organisation's level of digitalisation. This paper contributes to research on the IAF in two ways.

First, this research responds to Roussy and Perron's (2018) call for research on internal audit working practices. In a digitalised business environment, the IAF reconfigures its way of working by using data analytics in its missions. Our results show that digitalisation of the business environment is positively related with the use of data analytics for internal auditors: the more organisations are digitalised, the more it impacts how internal auditors work. Data analytics technologies offer the possibility for internal auditors to increase the accuracy and efficiency of their activities, to make forecasts and predictions about future events (Al-Htaybat and von Alberti-Alhtaybat, 2017) and perform continuous monitoring (Tschakert *et al.*, 2016). In turn, the recommendations following internal audit engagements are more likely to be

relevant for auditees. In this regard, data analytics can be considered a powerful tool for internal auditors to provide valuable insights into the organisation and to be closer to the business' reality. In a digital environment, organisations are required to integrate digital technologies within their different departments to be able to gain competitive advantage (Gupta *et al.*, 2020; Verhoef *et al.*, 2021). However, the results show that the use of data analytics is still limited in the IAF and that there is room for improvement to completely harness the potential of data analytics and other new technologies. While the benefits of new technologies are undeniable, these results question that organisations should have the ability to do so, which is not always the case (Gupta *et al.*, 2020). The implementation of new technologies comes with many challenges for organisations. It leads to a high degree of uncertainty and represents significant costs. In addition, it raises challenges in terms of change management. Organisations and their employees must exhibit adaptability and flexibility in order to use and accept new technologies (Gupta *et al.*, 2020).

Second, although prior research debates the added value of performing consulting activities (i.e. de Zwaan *et al.*, 2011; Lenz and Hahn, 2015; Roussy, 2013), our results indicate that the organisation's level of digitalisation positively influences the performance of consulting activities because the IAF uses more data analytics technologies. Organisations facing digital transformation need to deal with changes regarding risks, processes and strategy. Within this context, the performance of consulting activities could be a means for the IAF to demonstrate its added value by acting as an agent of change and helping the organisation with its business performance and anticipation of risks. These results question the final objective of internal auditing in a swiftly changing digitalised environment and the meaning of assurance activities. Bringing assurance to something that will change or will not exist tomorrow would not be valuable. Organisations are facing a highly uncertain and volatile environment (Schoemaker *et al.*, 2018). Helping organisations face this uncertain environment could require a change in the fundamental definition of the IAF, especially regarding the use of advisory and consulting activities. Digitalisation implies a flexible organisational structure (Verhoef *et al.*, 2021). The above result highlights how the IAF could play a role in helping the organisation as a change agent. However, the growing use of consulting activities also raises questions about the objectivity and independence of the IAF (Lenz and Hahn, 2015; Roussy, 2013; Soh and Martinov-Bennie, 2011). The results also indicate that the percentage of consulting activities is higher in small IAFs. However, the proportion of consulting activities undertaken represents a

reasonable part of the internal audit planning in small and large IAFs in the sample and the size of the IAF had no significant effect in the tested model.

From a managerial point of view, the above results show that digitalisation increases the use of data analytics by internal auditors. Therefore, it becomes crucial for internal audit departments to have the appropriate level of digital expertise to adopt such technologies and calls into question the training of internal auditors. Although organisations could put in place programmes to increase the digital expertise of their employees, internal audit master's programmes should be developed around digital and IT skills. Subsequently, new internal audit employees will have higher digital awareness and expertise. In the end, this could increase the global level of digital expertise of internal audit departments from the bottom upwards. Additionally, it raises the necessity for internal audit departments to attract and retain high-quality digital profiles (Bartlett *et al.*, 2016, 2017; Burton *et al.*, 2015). Digital profiles such as these, however, may be more likely to be interested in far more digitally oriented jobs than internal audit roles. Therefore, the IAF could first integrate digital aspects into internal audit day-to-day activities. Developing an advisory role could also increase the motivation of internal auditors. They will potentially move away from a 'watchdog' role, a role that is often negatively perceived by other departments, to a 'helper' role (Roussy, 2013).

This research project opens avenues for future research. It is based on a survey conducted in the US, which is a very regulated country (i.e. SOX requirements). Future research should investigate the evolution of the IAF's role and working practices in countries with different regulation systems and cultural contexts such as European countries. Additionally, this research provides insight into the current role practices of the IAF but does not address the organisational motivations behind this role and these practices. Future research should therefore investigate these motivations and the realities of different organisations with varying case studies. Additionally, the data on which the analyses are based is declarative. The level of reliability of the responses in relation to reality and the level of confidence the participants have in their ability to provide the information are unknown. Furthermore, we were not able to collect the IAF size and sectors of the respondents who did not complete the survey. As a result, this study may suffer from non-response bias (Gros *et al.*, 2017). The relation between the organisation's level of digitalisation and internal audit practices are the focus of this research, but we were not able to test causality. Future research could study causality by, for instance, investigating the effect of using digital technologies coupled with the performance of consulting activities by

internal auditors on the perceived quality of the IAF by different stakeholders (Trotman and Duncan, 2018) using experimental designs. The digitalisation of the organisation requires a high degree of organisational agility. This paper investigated organisations' level of digitalisation, focusing mainly on the development of a digital strategy and the digitalisation of business processes. Future research could investigate the use of data analytics and the performance of consulting activities in relation to the level of flexibility in the organisational structure (Verhoef *et al.*, 2021).

Chapter 3: The impacts of the use of data analytics and the performance of consulting activities on perceived internal audit quality

Nathanaël Betti, Steven DeSimone, Joy Gray and Ingrid Poncin

Introduction

The trend towards digitalisation 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). Digitalisation 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 organisations to adapt in order to survive in an increasingly complex environment. (IIA, 2019).

Digitalisation trends have grabbed the attention of management, boards, and regulators (ECIIA, 2019, Kane *et al.*, 2016). Board members and c-suite executives identify performance expectation shortfalls and competing with ‘born digital’ organisations 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 digitalisation.

Digitalisation provides an important opportunity for IAFs as they work to remain relevant by adding value to organisations, as perceptions of internal audit quality amongst stakeholders vary considerably. This paper extends the work of Trotman and Duncan (2018) by considering the impact of digitalisation, specifically the IAF’s use of data analytics, 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 organisations in managing the risks and opportunities that arise from digitalisation; activities

that 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 organisation'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 utilise 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 organisations is essential for the IAF to remain relevant (Stewart and Subramaniam, 2010; Castanheira *et al.*, 2010; Soh and Martinov-Bennie, 2011; Chapman, 2001). 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; 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 (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.

The ability of the IAF to add value to the organisation 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 interaction².
- The output: the IAF's ability to produce good reports.
- The outcome: the ability of the IAF to create value.

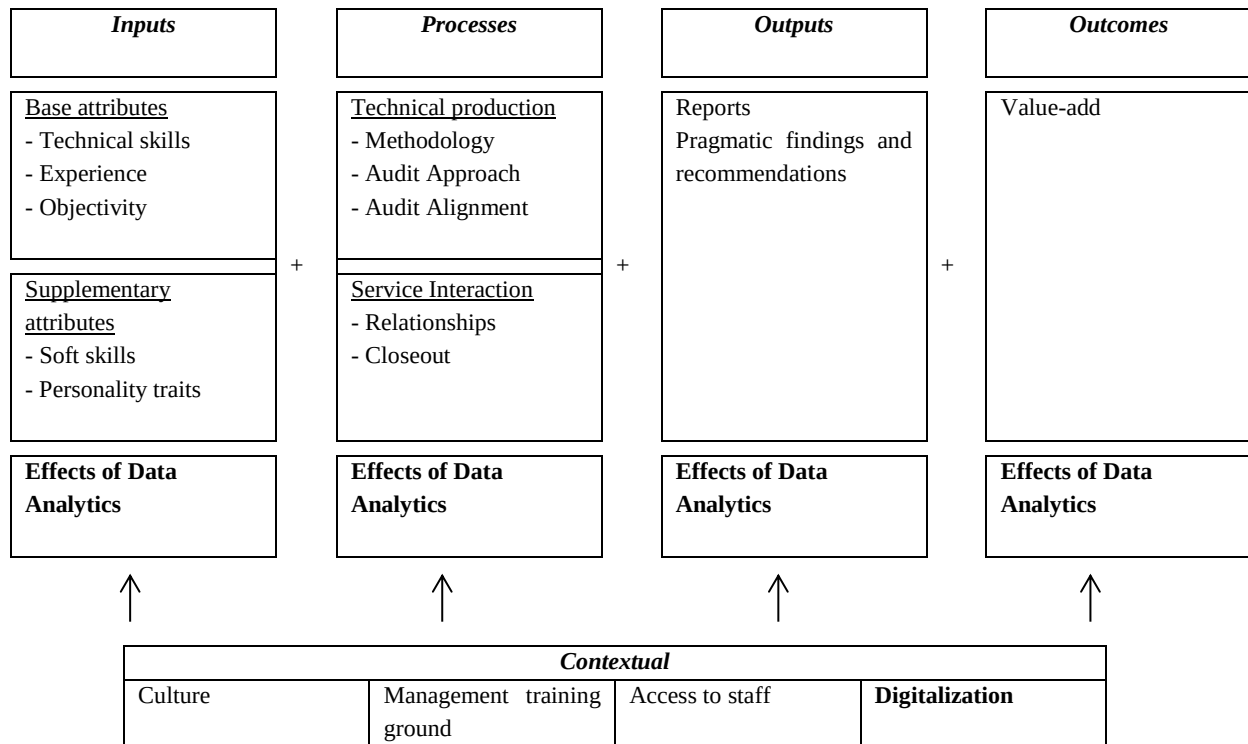
However, the IAF's major stakeholders, including in-house/co-sourced/outsourced internal auditors, the audit committee, senior management and external auditors, do not utilise a common method to assess the internal audit quality and tend to attribute emphasis differently to each dimension (Trotman and Duncan, 2018). For example, external auditors focus most on the input dimension, specifically the extent to which the IAF is objective³, while senior management focuses on the ability of the IAF to create value for the organisation (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 operationalised 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 the internal audit quality. However, their framework doesn't investigate digitalisation as a contextual factor. Given the importance and the effects of increasing digitalisation on organisations, this research extends Trotman and Duncan's (2018) work by investigating the impact of digitalisation as a contextual factor which affects internal audit quality. Specifically, this research project examines the role of a popular and expanding technology: data analytics. Figure 5 presents the internal audit quality framework developed by Trotman and Duncan (2018), adding digitalisation 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 organisational 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).

Figure 5: Multi-stakeholder internal audit quality framework and digitalisation



Source: adapted from Trotman and Duncan (2018)

Digitalisation as an additional contextual factor

Digitalisation describes the adoption and use of digital technologies in organisational, 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 in 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 the IAF bring more value to organisations and allow greater IAF alignment with the business (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; 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 prevention of emerging risks (PwC, 2018).

Prior literature highlights the importance for the IAF to perform consulting and advisory activities to assist the organisation in proactively dealing with risk and improving business efficiency (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 organisations (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.*, 2015a; Roussy, 2013). For instance, internal auditors could advise senior management on cybersecurity programmes and risk prevention (Dixon and Singer, 2011; Kahyaoglu and Caliyurt, 2018) and provide guidance in the implementation of new technologies (Flora and Rai, 2015). 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; 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 IAFs⁴, Trotman and Duncan (2018) did not specifically consider digitalisation 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 utilised, data analytics are 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 respondents 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 organisations’ biggest risks while balancing time and resources effectively (Christ *et al.*, 2019; ECIIA, 2019). Data analytics enable 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

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).

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 c-suite executives recognise 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).

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, which may lead to client frustration and a decrease in perceived internal audit quality (Christ *et al.*, 2019). Despite these challenges, we argue that with the use of data analysis 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 Covalleski, 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 organisational 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 organisation (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 to use 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 launch the right analyses (Al-Htaybat and von Alberti-Alhtaybat, 2017). The benefits of organisational 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 6 presents the manipulations of the experimental design.

Figure 6: Manipulations of the experimental design

Condition 1 • No Consulting • No Data Analytics	Condition 2 • No Consulting • Yes Data Analytics
Condition 3 • Yes Consulting • No Data Analytics	Condition 4 • Yes Consulting • Yes Data Analytics

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 allowed us to 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 organisation. After reading the scenario, the same questions were presented to each participant. Middle and upper manager participants who worked in the US were recruited using Prolific (Peer *et al.*, 2017). 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 IX 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 organisations and almost 16% worked in publicly traded organisations. The remaining participants are almost evenly divided between not-for-profit-organisations and public sector organisations. 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 analysed 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 X presents the descriptive statistics of the digital knowledge items. Panel A in Table XI indicates the results of the PCA and Panel B in Table XI the descriptive statistics of participants' single factor digital knowledge for the four groups.

Table IX: Description of participants [N=120]

	N	%	Min	Max	Mean	SD
Years of experience in the current position			1	32	6.08	4.20
Knowledge of digital technologies			2.50	10	7.97	1.70
Type of organisation						
Non-for-profit organisation	11	9.17				
Privately held (non-listed) organisations	80	66.67				
Public sector	10	8.33				
Publicly traded	19	15.83				
Gender						
Female	47	39.17				
Male	73	60.83				

Table X: Descriptive statistics of the digital knowledge scale

Digital knowledge items		No Data Analytics		Yes Data Analytics	
		No Cons	Yes Cons	No Cons	Yes Cons
		[N=29]	[N=28]	[N=31]	[N=32]
I consider myself knowledgeable about digital technologies.	Mean	7.93	8.04	8.29	8.00
	(SD)	(1.83)	(1.64)	(1.75)	(2.05)
I am extremely skilled at using digital technologies.	Mean	7.86	7.64	7.90	7.66
	(SD)	(1.77)	(1.83)	(2.13)	(2.03)
I know how to use digital technologies.	Mean	8.21	8.25	8.61	8.19
	(SD)	(1.50)	(1.88)	(1.63)	(1.93)
I know somewhat more than my peers about digital technologies.	Mean	7.62	7.68	8.06	7.50
	(SD)	(1.88)	(1.87)	(1.88)	(2.20)

Table XI: PCA results and summary of participants' single factor digital knowledge

Panel A: Results of the PCA									
	# of items			KMO index	Bartlett test			% Explained variance	Cronbach's alpha
Digital knowledge of participants	4			0.839	Khi ² : 435.039 ddl: 6 p-value: 0.000**			83.736	0.933
Panel B: Cell Means – Mean (Std. Dev.) [Cell Size]									
	No Data Analytics			Yes Data Analytics			Average		
No Consulting	7.91	(1.57)	[29]	8.22	(1.69)	[31]	8.07	(1.63)	[60]
Yes Consulting	7.90	(1.59)	[28]	7.84	(1.94)	[32]	7.87	(1.77)	[60]
Average	7.90	(1.57)	[57]	8.02	(1.82)	[63]			

* Significant at the 0.05 level (two-tailed)

** Significant at the 0.01 level (two-tailed)

Experimental design

The case was based on those developed by DeZoort *et al.* (2001) and Glover *et al.* (2008) and is presented in Appendix 3. The case contained four sections, providing information about a fictional organisation 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.

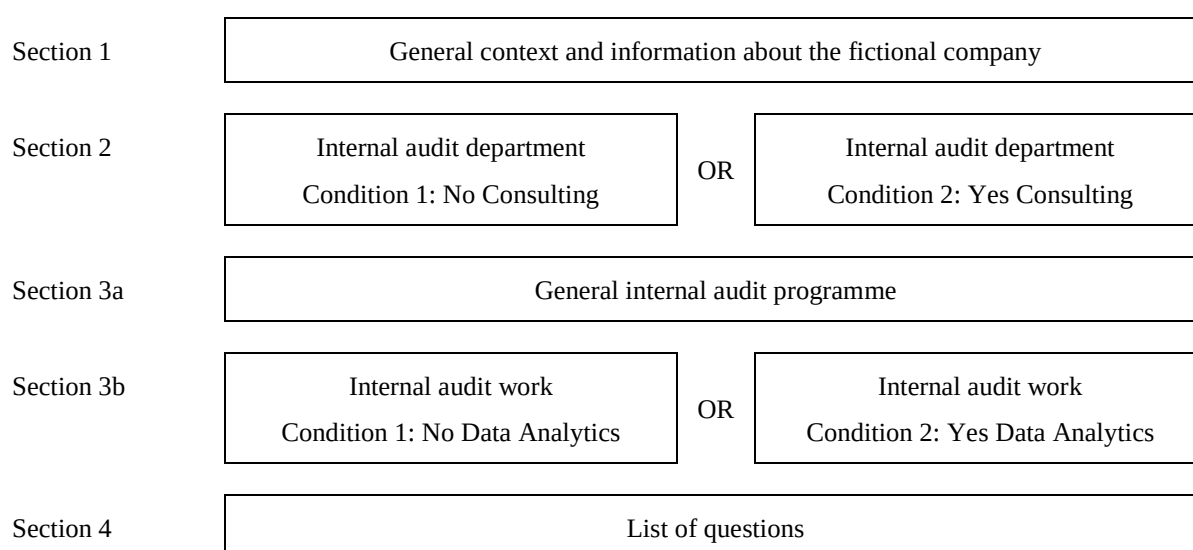
The first section of the case provided the general context of the experiment, including text stipulating that participants should assume the role of the CEO of a fictional organisation. In order to ensure that the study participants were able to understand the implications of the CEO role within an organisation, 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 manipulation 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 programme. 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 utilised 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 7 summarises the flow of the case.

Figure 7: Description of the procedure



Independent variables

The first manipulation involved the extent to which the IAF dedicated its time to consulting activities. 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 3 provides the experimental materials.

Dependent variables

The dependent variables include the four dimensions of the internal audit quality framework: the input, the process, the output and the outcome. 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 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'.

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 randomised 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 XII and Table XIII present the descriptive statistics of the manipulations, while Panel B in these tables shows the results of the manipulation check tests. Table XIV shows the equivalence tests between the four groups.

Table XII: Test of consulting manipulation check

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]									
	No Data Analytics			Yes Data Analytics			Average		
No Consulting	2.17	(3.23)	[29]	3.84	(4.23)	[31]	3.03	(3.84)	[60]
Yes Consulting	7.11	(2.57)	[28]	7.63	(2.74)	[32]	7.38	(2.66)	[60]
Panel B: ANOVA Results									
Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)				
Consulting	567.675	1	567.675	52.084	0.000***				

*** Significant at the 0.01 level (one-tailed)

Table XIII: Test of data analytics manipulation check

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]								
	No Consulting			Yes Consulting			Average	
No Data Analytics	6.55	(3.47)	[29]	5.93	(3.71)	[28]	6.25	(3.57) [57]
Yes Data Analytics	8.48	(1.75)	[31]	8.59	(2.03)	[32]	8.54	(1.88) [63]
Panel B: ANOVA Results								
Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)			
Data Analytics	157.488	1	157.488	19.892	0.000***			

*** Significant at the 0.01 level (one-tailed)

Table XIV: Test of equivalence between groups

ANOVA Results					
Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)
Digital knowledge	2.729	3	0.910	0.311	0.818
Years in the current job	55.234	3	18.411	1.047	0.375
Gender	0.601	3	0.200	0.830	0.480

Test of hypotheses

Table XV 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. Table XVI presents the main results of the general linear models for each of the seven variables. Appendix 4 presents the descriptive statistics and the detailed results of the general linear models for each of the seven variables as well as the correlation matrix.

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

Table XV: Descriptive statistics

Quality dimension and description*		No Data Analytics		Yes Data Analytics	
		No Cons	Yes Cons	No Cons	Yes Cons
		[N=29]	[N=28]	[N=31]	[N=32]
<u>Input</u> : The internal audit department is competent.	Mean	8.21	8.25	8.68	8.84
	(SD)	(1.54)	(1.69)	(1.33)	(1.35)
<u>Input</u> : The internal audit department is objective.	Mean	7.24	7.11	7.39	7.28
	(SD)	(1.81)	(2.56)	(1.73)	(2.53)
<u>Process</u> : The internal audit department has an effective audit methodology.	Mean	7.90	8.04	8.19	8.34
	(SD)	(1.63)	(2.19)	(1.78)	(1.82)
<u>Process</u> : The internal audit department is likely to develop strong working relationships with management.	Mean	7.10	6.96	6.32	8.09
	(SD)	(2.30)	(2.66)	(2.52)	(1.96)
<u>Output</u> : The internal audit department is likely to provide accurate and timely reports.	Mean	8.34	8.61	8.48	8.72
	(SD)	(1.37)	(1.17)	(1.71)	(1.73)
<u>Output</u> : The internal audit department is likely to provide relevant recommendations.	Mean	8.00	8.36	7.77	8.88
	(SD)	(1.77)	(1.22)	(2.33)	(1.24)
<u>Outcome</u> : The internal audit department is likely to bring value to the company.	Mean	8.38	8.29	8.55	8.56
	(SD)	(1.32)	(1.74)	(1.36)	(1.61)

* All variables were measured on 11-point scales.

Concerning H2, results suggest that the perceived quality of the relationship between the IAF and management was higher when internal auditors performed consulting activities than when they did 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 was higher when internal auditors performed 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; $F(1;116) = 0.90$; $p = 0.765$).

Table XVI: Test of hypotheses

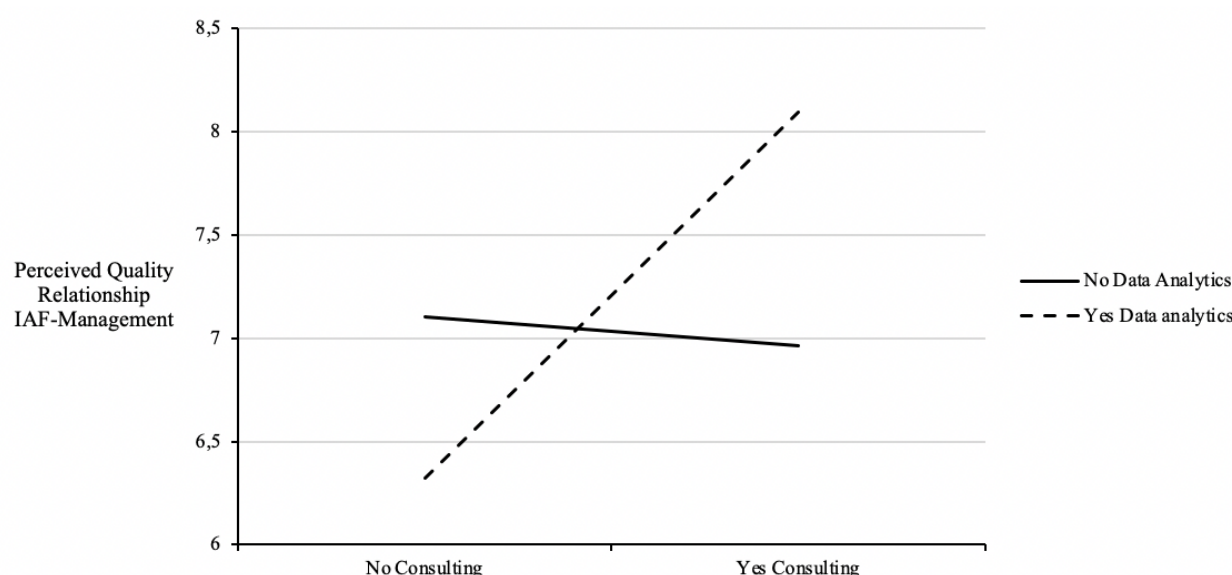
	Df	Mean square	F-ratio	p-value (two-tailed)
Competence of the IAF (Input dimension)				
Consulting	1	0.328	0.150	0.699
Data Analytics	1	8.471	3.884	0.051*
Consulting * Data Analytics	1	0.114	0.052	0.820
Objectivity of the IAF (Input dimension)				
Consulting	1	0.431	0.090	0.765
Data Analytics	1	0.765	0.160	0.690
Consulting * Data Analytics	1	0.006	0.001	0.972
Effective methodology of the IAF (Process dimension)				
Consulting	1	0.626	0.181	0.671
Data Analytics	1	2.738	0.791	0.376
Consulting * Data Analytics	1	0.001	0.000	0.987
Relationship of the IAF with management (Process dimension)				
Consulting	1	19.920	3.560	0.062*
Data Analytics	1	0.909	0.162	0.688
Consulting * Data Analytics	1	27.294	4.877	0.029**
Accuracy of the IAF's reports (Output dimension)				
Consulting	1	1.849	0.796	0.374
Data Analytics	1	0.470	0.202	0.654
Consulting * Data Analytics	1	0.006	0.002	0.961
Relevance of IAF's recommendations (Output dimension)				
Consulting	1	15.898	5.434	0.021**
Data Analytics	1	0.638	0.218	0.641
Consulting * Data Analytics	1	4.136	1.414	0.237
Added value of the IAF (Outcome dimension)				
Consulting	1	0.047	0.021	0.886
Data Analytics	1	1.487	0.648	0.422
Consulting * Data Analytics	1	0.087	0.038	0.846

* Significant at the 0.10 level (one-tailed)

** Significant at the 0.05 level (one-tailed)

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 8 plots this interaction. When internal auditors used data analytics and performed consulting activities, the perceived quality of the relationship between the IAF and the 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.

Figure 8: 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 influenced the input dimension of the internal audit quality framework, while the performance of consulting activities positively influenced the process and output dimensions. In addition, we observed an interaction effect between these two dimensions.

Examining first the use of data analytics, our findings indicate that managers perceived the IAF as more competent when it uses data analytics to accomplish its mission. This is likely to be 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 impact perceived quality regarding objectivity and the other dimensions of the quality framework. First, managers did not perceive that data analytics impacted the process dimension, which refers to the effectiveness of the methodology and to service interactions. However, we did observe an interaction effect as discussed below. Second, contrary to expectations, we observed that the use of data analytics was perceived to affect neither the quality of reports nor the perceived relevance of recommendations. 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 effect. Finally, we also expected an increase in perceived added value when internal auditors use data analytics, but our results did not support this. That no effect of data analytics was identified on the process, output and outcome dimensions is surprising given the fact that the literature shows 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 could be considered that these kinds of analyses would enable to make the audit methodology more effective. Also, it could increase the accuracy and the relevance of recommendations since the data analytics allow analyses of full data sets, making the findings fact-based. A further effect on the outcome 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.

When examining the performance of consulting activities, our results suggest that managers perceived the quality of their relationship with internal auditors as higher when internal auditors performed consulting activities. This is consistent with prior research indicating that consulting activities bring value to organisations (Stewart and Subramaniam, 2010; Castanheira *et al.*, 2010; Soh and Martinov-Bennie, 2011; Chapman, 2001). Also, when internal auditors performed consulting activities, the perceived quality of their recommendations was higher. This may be because internal auditors performing 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. 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, the effectiveness of the methodology, the quality of the reports and the perceived added value of the IAF. This last result is surprising given the fact that prior research indicates that consulting activities are considered as value-adding activities (i.e. 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 performed 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 organisations. 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 threefold. First, we assessed 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: digitalisation. While

Trotman and Duncan's (2018) framework stresses the importance of contextual factors, it does not consider digitalisation as a contextual factor. It also does not consider the role of data analytics, now a particular, popular and expanding technology. Our findings suggest that digitalisation does impact perceived internal audit quality, specifically IAF use of data analytics. This research also 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 performance of consulting activities, especially combined with the use of data analytics, improves managers' perceptions of internal audit quality. Thus, internal auditors may want to consider increasing their use of data analytics. It raises the question of how the IAF could develop such skills inside internal audit departments. Internal audit departments should develop their data analytics expertise by training their own employees as well as attracting people with data analytics expertise when they hire. It also raises the question whether all internal auditors inside the department should have data analytics skills or whether internal audit departments should have only some internal auditors specialising in data analytics. Internal auditors should also increase the proportion of the planning dedicated to consulting activities to strengthen the relationship with management. The recently updated three lines of defence 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. The main limitation of this paper concerns the fact that the data are declarative and the fact we do not know the level of reliability or confidence in their responses. Additionally, this research focused on the perceptions of only one internal audit stakeholder. Trotman and Duncan (2018) indicate that the perception of internal audit quality depends on the stakeholder. Future research could 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 should 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. Future research could 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.

Conclusion

Organisations continuously implement new technologies that lead them to adapt their strategies, processes and business models (Legner *et al.*, 2017; Verhoef *et al.*, 2021). It changes the risk landscape and presents challenges for organisations (Beasley *et al.*, 2018) in a more volatile, complex and uncertain environment (Schoemaker *et al.*, 2018). As a result, the digitalisation of the business environment and its impact on organisations are critical issues for the internal audit function (IAF) (ECIIA, 2018, 2019). Developed around three essays, this doctoral dissertation investigated how the digitalisation of the business environment has influenced the IAF.

This conclusion summarises the findings of the three essays presented in the previous chapters and the contributions of this doctoral thesis. We conclude this section by presenting its limitations as well as avenues for future research.

Summary of the findings

Through the three essays and the use of complementary qualitative and quantitative methods, this doctoral dissertation aimed to better understand how digitalisation of the business environment influences the IAF. Table XVII presents the summary of the findings of the three essays and Figure 9 presents a conceptual framework of the findings.

Essay 1 aimed to understand how the IAF has evolved in the digitalised environment. Specifically, this essay sought to better understand the evolution of the scope, role and working practices of the IAF through in-depth interviews conducted with members of management committees, chief audit executives and internal auditors. The findings of this essay are threefold. First, this research stresses that the scope of the IAF is more oriented toward IT risks, which have increased in importance. Internal audit planning is also expected to be more agile in two ways. On the one hand, the IAF is required to reduce the time between the risk assessment and the beginning of audit missions. On the other hand, the IAF is expected to incorporate ‘buffer days’ in its planning to be able to include new missions following changes in organisational strategy. Agile planning is crucial for the IAF to stay aligned with organisational goals in a digitalised environment characterised by a high degree of volatility, complexity and uncertainty (Schoemaker *et al.*, 2018). Second, this research highlights that the

role of the IAF is increasingly oriented towards consulting and advisory activities, and accordingly, the demand for consulting activities has increased. In a digitalised environment, the IAF is expected to be more of a business partner than a controller in order to help the organisation to manage the (emerging) risks that digitalisation induces. The performance of consulting activities appears to lead the IAF to advise management on strategy. Third, this research highlights that the working practices of internal auditors have also evolved. Digital skills have become crucial for the IAF as new digital tools are increasingly being implemented and because the business processes that the IAF is required to audit are more digitalised. Therefore, digital skills are needed to understand digitalised business processes. Furthermore, new technologies are being progressively implemented in internal audit departments, especially in data analytics. This technology enables internal auditors to test entire data sets instead of samples and enables them to perform advanced analyses, such as predictive analyses (Al-Htaybat and von Alberti-Alhtaybat, 2017). However, this requires a certain level of digital expertise from internal auditors.

Essay 2 focused on testing the conceptual framework developed in Essay 1 with a survey submitted to chief audit executives. Essay 1 previously identified that the performance of consulting activities has increased due to the digitalisation of the business environment. In addition, Essay 1 highlighted that internal audit departments increasingly use data analytics. Essay 2 built on these findings and aimed to show the influence of digitalisation on consulting activities and the use of data analytics. It also investigated the mediating role of data analytics in the relationship between digitalisation and the performance of consulting activities. This research showed a positive relation between the organisation's level of digitalisation and the percentage of use of data analytics by internal auditors. There was also a positive relation between the organisation's level of digitalisation and the percentage of the internal audit planning dedicated to consulting activities. Moreover, it showed that the level of use of data analytics by the internal auditors mediated the relationship between the organisation's level of digitalisation and the proportion of consulting activities performed by the IAF. Essay 2, thus, confirmed the findings that emerged from Essay 1, but also extended them by highlighting how the use of data analytics can favour the performance of consulting activities by internal auditors.

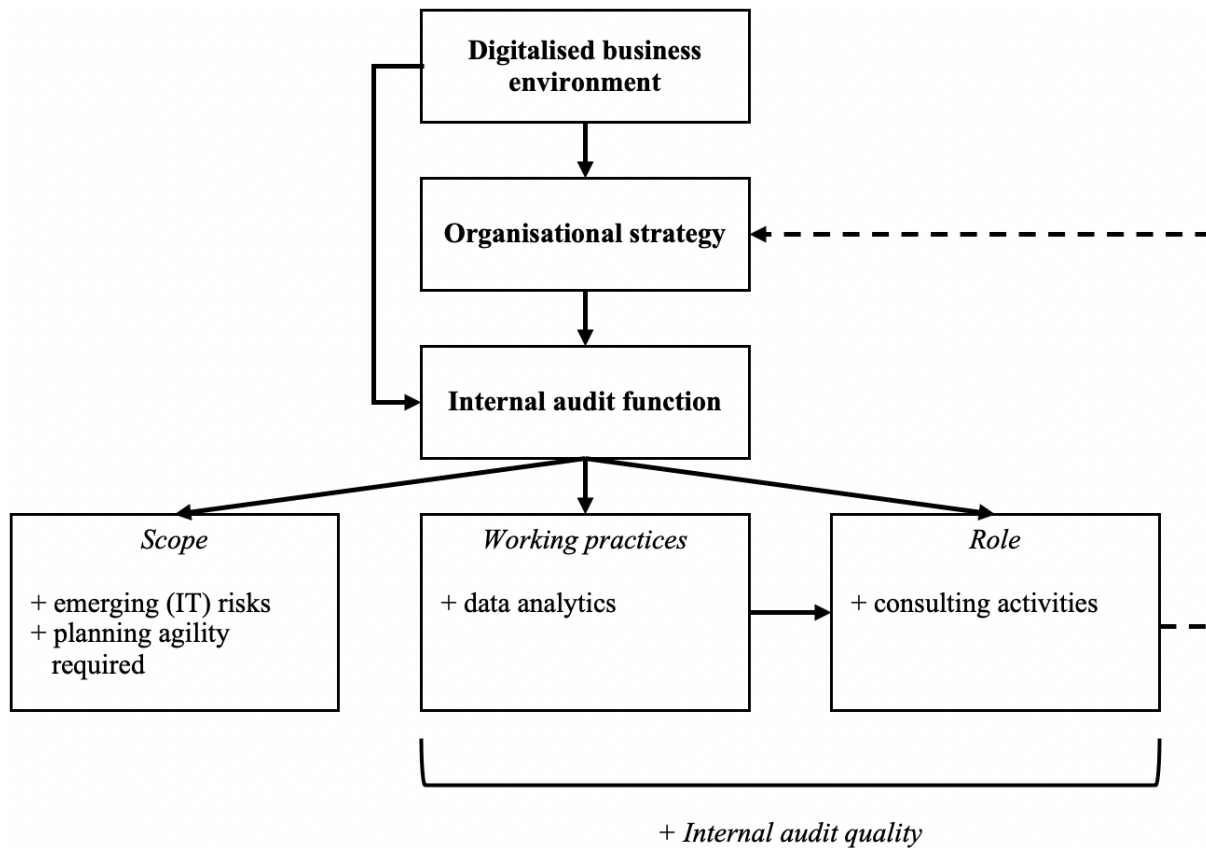
Essay 3 further investigated the effect of digitalisation on the IAF by specifically examining its effect on the perceived internal audit quality. Trotman and Duncan (2018) developed an internal audit quality conceptual framework based on interviews and identified four dimensions of

internal audit quality: input, process, output and outcome. With an online scenario-based experiment conducted with middle and upper managers, this research examined the effects of the use of data analytics and the performance of consulting activities by internal auditors on the four dimensions of the internal audit quality framework. The main contribution of this essay was that it tested the conceptual framework developed by Trotman and Duncan (2018). This research first showed that when internal auditors use data analytics, they are perceived as more competent than when they do not use them (input dimension). Second, this research showed that the recommendations of internal auditors are perceived as more relevant when internal auditors perform consulting activities (output dimension). Third, it demonstrated that the quality of the relationship between internal auditors and the management is higher when internal auditors perform consulting activities (process dimension). Finally, the findings showed a significant interaction effect between the use of data analytics and the performance of consulting activities on the perceived quality of the relationship between internal auditors and management. Findings indicate that when internal auditors perform consulting activities and use data analytics, internal auditors are more likely to develop strong working relationships with management.

Table XVII: Summary of the findings of the three essays

Research question	Method	IAF stakeholders investigated	Dependent variables	Key findings
Essay 1: How has the IAF evolved in this digitalised environment?	In-depth interviews	- Senior management - Chief audit executives - Internal auditors	- IAF scope - IAF role - IAF working practices	- Scope: the IAF is required to develop more agile planning and the importance of IT risks increases. - Role: the demand for consulting activities increases. The performance of consulting activities leads the IAF to have more influence on organisational strategy. - Working practices: the IAF is expected to have more digital expertise because: (i) the business processes are more digitalised and (ii) more digital tools are implemented in IAFs, especially data analytics tools.
Essay 2: How does the IAF modify its activities and practices in relation to the digitalisation of the organisation?	Survey	Chief audit executives	- IAF role - IAF working practices	- The organisation's level of digitalisation is positively related to the percentage of use of data analytics by internal auditors during their missions and the percentage of internal audit planning dedicated to consulting activities. - The use of data analytics mediates the relationship between the organisation's level of digitalisation and the proportion of the internal audit planning dedicated to consulting activities.
Essay 3: What is the effect of the use of data analytics and the performance of consulting activities on the perceived internal audit quality?	Online scenario-based experiments	Senior management	Internal audit quality	- Managers perceive the IAF as more competent when it uses data analytics. - When the IAF performs consulting activities, managers perceive that the quality of their relationship with internal auditors is higher and that auditors' recommendations are more relevant. - 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.

Figure 9: Conceptual model summarising the research findings



Contributions

The section presents the contributions of this doctoral dissertation. The essays included in this doctoral thesis collectively provide new insights on how the digitalisation of the business environment influences the IAF and bring theoretical, methodological and managerial contributions.

Theoretical contributions

Together, the essays included in this doctoral dissertation enable a better understanding of the evolution of the IAF in the digitalised business environment. From a theoretical perspective, this doctoral thesis allows for a more holistic and comprehensive view of the IAF in a digitalised business environment by gathering diverse perspectives on the effects of digitalisation on the IAF and by capturing different dimensions of the internal audit quality.

Prior research that investigated the IAF primarily focused on the perspective of one IAF stakeholder (i.e. Abbott *et al.*, 2012; Lin *et al.*, 2011; Prawitt *et al.*, 2009; Prawitt *et al.*, 2012).

Nevertheless, the perception of the IAF depends on the stakeholder's perspective (Trotman and Duncan, 2018). In this research, we gathered the perceptions of internal auditors, chief audit executives and senior management. While the views of internal auditors and chief audit executives enabled us to better understand the evolution of their function, collecting the perspectives of senior management as well enabled us to grasp the business challenges that organisations face and to better understand the relationships between senior management and internal auditors. These relationships have become critical for internal auditors to be at the forefront of strategic challenges (IIA, 2020). With digitalisation, internal auditors are expected to assume the role of a business partner. While the IAF adopted more of a controller role in the previous decade, senior management now demands that the IAF advise them in managing the risks introduced by digitalisation. Senior management perceives the performance of consulting activities as a way for the IAF to add value to their organisations and as a way to improve the quality of their relationship. Nevertheless, this changed relationship can trigger tensions for internal auditors because the performance of consulting activities raises questions about their objectivity (i.e. Lenz and Hahn, 2015; Roussy, 2013; Soh and Martinov-Bennie, 2011). In this research, we have seen that internal auditors are often torn between their independence and the added value that consulting activities can bring. To cope with these tensions, they tend to adopt an advisory role that does not imply any actual responsibility on their part. This can be seen as a form of resolution strategy where internal auditors consider the advisory role to be a means of addressing tensions to gain equilibrium (Poole and Van de Ven, 1989; Smith and Lewis, 2011).

Second, this research contributes to prior research on the internal audit quality by considering multiple dimensions of perceived quality and by investigating digitalisation as a contextual factor that influences how internal audit quality is perceived. Prior research has tended to focus on the competence and/or objectivity of internal auditors to assess internal audit quality (i.e. Glover *et al.*, 2008; Brandon, 2010; Davidson *et al.*, 2013). Nevertheless, Trotman and Duncan (2018) have more recently developed a broader view of internal audit quality. Based on interviews, they identified four dimensions of internal audit quality: input, process, output and outcome. In this doctoral thesis, we considered these four dimensions to capture the upper and middle managers' perceptions of internal audit quality, and we developed measures to assess these four dimensions. In addition, Trotman and Duncan (2018) stressed the importance of contextual factors in the evaluation of internal audit quality, but they didn't investigate the perception of the internal audit quality in the digitalised business context. Therefore, we extend

their research by specifically examining the effects of the use of data analytics and the performance of consulting activities by internal auditors on upper and middle managers' perceptions of internal audit quality. This research shows that managers perceive internal auditors as more competent when they use data analytics than when they do not (input dimension). It also shows that they perceive the recommendations of internal auditors as more relevant when internal auditors perform consulting activities (output dimension). Furthermore, this research shows that they perceive the quality of the relationship between internal auditors and management as higher when internal auditors perform consulting activities (process dimension). Finally, the findings show a significant interaction effect between the use of data analytics and the performance of consulting activities on the perceived quality of the relationship between internal auditors and management (process dimension).

Methodological contributions

Following our post-positivist epistemological positioning, we used multiple methods to achieve research objectives. The results were triangulated by applying a multi-methods approach to capture different perspectives of the phenomenon under study (Caracelli and Greene, 1993; Creswell and Plano Clark, 2017; Patton, 2014; Wildemuth, 1993). Combining qualitative and quantitative methods to examine the evolution of the IAF in the digitalised business environment enabled us to better understand the different stakeholders' perceptions with in-depth interviews but also to confirm the findings that emerged from the interviews and to further investigate the processes that come into play with a survey and an experiment.

In Essay 1, informants explained that the role of the IAF is increasingly oriented towards consulting. In a digitalised environment, the IAF is expected to be more of a business partner and to guide the organisation in the management of the (emerging) risks that digitalisation induces. It also emerged that data analytics are being progressively implemented in internal audit departments. Such technology appears to support the IAF work by enabling them to perform advanced analyses, such as predictive analyses. For Essay 2, a survey was conducted with the aim of testing the conceptual framework in Essay 1 and, specifically, of investigating the current practices of internal audit departments. Essay 2 showed the influence of digitalisation on consulting activities and the use of data analytics. It specifically exhibited a positive relation between the level of digitalisation of an organisation and the use of data analytics by internal auditors. It also displayed a positive relation between the level of digitalisation of organisations and the percentage of the internal audit planning dedicated to

consulting activities. This research also highlighted that the use of data analytics by the internal auditors mediated the relationship between the organisation's level of digitalisation and the performance of consulting activities performed by the IAF. Essay 2, therefore, confirmed the emerging findings from Essay 1, but it also extended them by stressing how the use of data analytics by the IAF can favour the performance of consulting activities. Essay 3 further examined the effects of the use of data analytics and the performance of consulting activities on the IAF by specifically exploring its effect on the perceived internal audit quality with an experiment among upper and middle managers. This research showed that managers perceive the IAF as more competent when they use data analytics in their mission, and they perceive the IAF's recommendations as more relevant when they perform consulting activities. In addition, it showed that managers perceive the quality of their relationship to be stronger when internal auditors use data analytics and perform consulting activities.

The use of different, yet complementary, methods, therefore, enabled us to have a more comprehensive view of the effects of digitalisation on the IAF and, especially, of how the use of data analytics, a technology increasingly used by the IAF, combined with the performance of consulting activities can increase management's perception of internal audit quality.

Managerial contributions

This doctoral research also provides practitioners with several insights. It shows that the IAF is expected to adapt to meet the requirements that the digitalisation of the business environment induces.

First, this research has highlighted the importance for the IAF to adapt its scope. The IAF should have an agile approach to develop audit planning to remain aligned with organisational goals, which can change quickly in the digitalised business environment. To be agile, the IAF can reduce the time between risk assessment and the beginning of audit missions. In addition, it can allocate a certain number of buffer days in case new missions need to be included in the schedule following changes in the organisational strategy. Regular contact with managers of the different business lines at the various stages of the IAF's missions can also help it to stay connected to business changes and anticipate shifts in the planning.

Second, this thesis has stressed the importance of advisory activities for the IAF in a digitalised context. The volatility, complexity and uncertainty inherent to the digitalisation of the

environment (Schoemaker *et al.*, 2018) change the expectations for the IAF. Senior management expect the IAF to act more as a business partner than as a controller, moving from a 'watchdog' to a 'helper' role (Roussy, 2013). The IAF is expected to perform more consulting activities to help organisations face the changing business environment and guide them through strategic changes. Performing consulting activities appears to help internal auditors gain a better understanding of the business reality and add value to organisations. Nevertheless, it can also raise questions about the objectivity of internal auditors (i.e. Lenz and Hahn, 2015; Roussy, 2013; Soh and Martinov-Bennie, 2011). This research highlighted that the adoption of a consulting role can trigger tensions for internal auditors, who can be torn between their independence and the added value that consulting activities bring to organisations. To cope with these tensions, they tend to adopt an advisory role that does not imply any actual responsibility on their part, yet enables them to remain close to day-to-day operational realities and to align their activities with strategic challenges and risks. Adopting such a role appears to enable them to achieve a suitable balance between maintaining independence and bringing value to organisations.

Third, the working practices of internal auditors need to evolve. Data analytics are progressively integrated into internal audit departments, although there is still room for improvement in this development to completely harness the potential of this technology (IIA, 2018, 2019). Data analytics can help the IAF to increase the accuracy and the efficiency of its analyses. Entire data sets can be tested, making analyses more fact-based than sampling. Furthermore, data analytics is not limited to use in the testing phase of audit engagements; it can also be used during risk assessment. With data analytics, the IAF can also extract data directly from the relevant sources, thus becoming less dependent on management reports. Using data analytics technologies could therefore help internal auditors to bring additional value to their organisation due to the broader and more precise scope of analysis they impart during internal audit tasks. In addition, using these technologies in combination with performing an advisory role can improve managers' perceptions of internal audit quality.

Finally, the implementation of new technologies such as data analytics leads to changes in the skills expected in internal audit departments and, especially, to switch in priorities between financial skills and digital skills. First, the integration of data analytics requires that internal auditors have a certain level of digital knowledge to use this technology during their missions. Then, as business processes become increasingly digitalised, internal auditors should be able to

understand these processes and grasp the implications for risks. As a result, internal auditors should have digital skills and awareness. Developing the digital and IT skills of the internal audit department appears to provide an opportunity to increase the value and credibility of the IAF. Acquiring these skills is particularly important as internal auditors still appear to struggle with digital technologies and IT risks, so they tend to outsource their IT-related activities. Having in-house internal auditors who are both familiar with the organisation and have digital expertise could be advantageous for organisations. Attending training sessions to develop their own data analytics skills and hiring skilled personnel could help internal audit departments reduce the outsourcing of some processes and activities.

Limitations and future research

This doctoral dissertation is not exempt from limitations, which are avenues for future research. In Table XVIII, we propose a future research agenda by presenting the research questions that could be investigated and their expected contributions.

First, this doctoral research focuses on the perceptions of three primary stakeholders, namely internal auditors, chief audit executives and senior management. The perception of internal audit quality depends on the stakeholder (Trotman and Duncan, 2018). Future research could investigate the perceptions of other IAF stakeholders, especially external auditors. For instance, future research could investigate the effects of digitalisation on internal audit quality by conducting experiments with external auditors. Prior research suggests that external auditors perceive the IAF as less objective when internal auditors are involved in operational activities, thus leading to low-quality assessment (Glover *et al.*, 2008; Prawitt *et al.*, 2009). Therefore, from the perspective of external auditors, the performance of consulting activities by IAFs may lead to a decrease in perceived quality. Future research could also investigate whether, by facilitating a more fact-based analysis, the use of data analytics can mitigate the effect of the performance of consulting activities on external auditors' perceptions of the internal audit quality.

Second, this research focused on the effects of one new technology, data analytics, on the IAF work. Data analytics emerged from the qualitative research as a technology that internal auditors increasingly use in their missions. This research showed that implementing this technology is considered the first step towards the integration of other technologies, such as artificial intelligence, and advanced audit practices, such as continuous auditing. Currently,

these technologies and practices are rarely used in internal audit departments but will be progressively integrated in the coming years. Future research could therefore investigate how the IAF evolves with the use of these technologies and practices and how it affects their relationships with stakeholders.

Third, this thesis highlights the importance of an appropriate level of digital skills in the internal audit workforce. Future research could investigate how internal auditors can structure their departments to meet this new requirement, either by having internal auditors with digital skills or by including some data specialists in addition to generalist internal auditors. Prior research has studied the effects of different practices, such as the use of a management training ground or a role more oriented towards consulting, in order to enhance the recruitment of high-quality graduates (Bartlett *et al.*, 2016, 2017; Burton *et al.*, 2015). Future research could investigate how an internal audit master's programme structured around digital and data analytics could enhance the recruitment of early career graduates.

Fourth, the qualitative research highlighted how the scope, role and working practices of the IAF have evolved in the digitalised business environment. With the survey and the online experiment, we focused on the influence of digitalisation on the role and the working practices of internal auditors. Future research could further investigate the effects of digitalisation on the scope of the IAF, especially the management of emergent risks. Future research could, for example, investigate digitalisation's effects on the management of cybersecurity risks as cybersecurity breaches tend to increase year on year (Coleman *et al.*, 2018).

Table XVIII: Future research agenda

Topic	Proposed research questions	Expected contributions
Internal audit quality	How does the use of data analytics and the performance of consulting activities influence stakeholders' perceptions of internal audit quality?	Further investigate internal audit stakeholders' perceptions of internal audit quality.
New technologies	- How could the IAF integrate artificial intelligence into its missions? - How does artificial intelligence influence the IAF? - How does artificial intelligence influence the IAF's relationship with its stakeholders?	Further examine the integration of artificial intelligence into internal audit departments, its influence on the IAF, and its impact on the relationship the IAF has with its stakeholders.
Digital skills	- How can the IAF structure itself to integrate digital skills? - How can the recruitment of high-quality, early graduates with digital profiles be enhanced?	Further investigate the development and the integration of digital expertise in internal audit departments.
IT risks	- How does digitalisation influence the IAF's management of IT risks? - How does the integration of new technologies influence the management of IT risks?	Further examine how digitalisation influences the IAF's management of IT risks.

Opening note about the future of auditing

This doctoral thesis enabled a better understanding of the IAF in a digitalised business environment. Internal auditors tend to take a more advisory role and tend to integrate digital technologies such as data analytics in their daily work. The evolution of the IAF and the business environment raises the question of the labelling of the function: Can we still talk about 'audit'?

Auditing involves controlling and bringing assurance to processes and matters that have already occurred and are already known. In past decades, auditors were mainly associated with a controller role. Nevertheless, the business context is evolving rapidly and causing more uncertainty for organisations (Schoemaker *et al.*, 2018). Uncertainty involves matters that haven't happened yet and are not known (Teece and Leih, 2016). To deal with this uncertainty, and to guide and advise organisations, internal auditors now tend to adopt a more 'advisory role'. This advisory role could take many forms and be more focused towards anticipation and prevention in order to help organisations deal with uncertainty and potential shifts resulting

from the rapidly changing business environment. In addition, internal audit departments are progressively implementing new technologies, specifically data analytics. Data analytics enable internal auditors to perform advanced analyses on large data sets such as predictive or prescriptive analyses (Al-Htaybat and von Alberti-Alhtaybat, 2017). Therefore, new technologies offer the possibility for internal auditors to orient even more of their activities towards the potential impacts of future events.

As a result, the evolution of the IAF from a controller to an advisory role and the progressive integration of new technologies in internal audit departments question the relevancy and labelling of the word 'audit' in the current changing and uncertain business environment. To meet the current and future challenges of organisations and to continue to bring value to them, we could, for instance, consider labelling the function 'board advisor' or 'internal advisor'.

Appendices

Appendix 1: Interview guide 1

Introduction

- Can you tell me more about you and about your professional career?
- Can you tell me more about your organisation's internal audit department?

IAF scope and role

- What types of activity does the internal audit department carry out?
- Have the activities performed by the internal audit department evolved in recent years?
If so, in what way(s)?
- What is the current planning of the internal audit department?
- How is the planning of the internal audit department determined?
- To what extent do you feel that the internal audit activities cover the most important risks of the organisation?

Organisational strategy

- What is the relationship between the internal audit activities and the organisational strategy?
- To what extent do you feel that the internal audit activities align with the strategy of the organisation?
- To what extent is the internal audit planning in line with the risk profile of the organisation?

Appendix 2: Interview guide 2

Introduction

- Can you tell me more about you and about your professional career?
- Can you tell me more about your organisation's internal audit department?

Digitalisation

- How would you qualify the importance assigned to technologies in general and to the digital world in your organisation?
- How would you qualify the importance given to new technologies in your internal audit department?
- When talking about digital transformation and digital innovations, we often hear about big data, artificial intelligence, the internet of things, blockchain, etc. Within these new technologies, which are the ones that are used in your internal audit department and for what purposes?
- What are the means used to implement new technologies in your internal audit department?
- Could you describe to what extent digital technologies are used in each step of your internal audit process?
- What are the pros and cons of the use of digital technologies in your internal audit missions?
- In your opinion, how could your department optimise the use of these technologies?

Appendix 3: 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 programme 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.

Appendix 4: Descriptive statistics and detailed results of the general linear models

Competence of the IAF (Input dimension)

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]

	No Data Analytics			Yes Data Analytics			Average		
No Consulting	8.21	(1.54)	[29]	8.68	(1.33)	[31]	8.45	(1.44)	[60]
Yes Consulting	8.25	(1.69)	[28]	8.84	(1.35)	[32]	8.57	(1.53)	[60]
Average	8.23	(1.60)	[57]	8.76	(1.33)	[63]			

Panel B: ANOVA Results

Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)
Intercept	8634.741	1	8634.741	3958.987	0.000
Consulting	0.328	1	0.328	0.150	0.699
Data Analytics	8.471	1	8.471	3.884	0.051
Consulting * Data Analytics	0.114	1	0.114	0.052	0.820
Error	253.002	116	2.181		
Total	8949.000	120			

Objectivity of the IAF (Input dimension)

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]

	No Data Analytics			Yes Data Analytics			Average		
No Consulting	7.24	(1.81)	[29]	7.39	(1.73)	[31]	7.32	(1.75)	[60]
Yes Consulting	7.11	(2.56)	[28]	7.28	(2.53)	[32]	7.20	(2.52)	[60]
Average	7.18	(2.19)	[57]	7.33	(2.16)	[63]			

Panel B: ANOVA Results

Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)
Intercept	6297.281	1	6297.281	1314.264	0.000
Consulting	0.431	1	0.431	0.090	0.765
Data Analytics	0.765	1	0.765	0.160	0.690
Consulting * Data Analytics	0.006	1	0.006	0.001	0.972
Error	555.813	116	4.791		
Total	6879.000	120			

Effective methodology of the IAF (Process dimension)

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]

	No Data Analytics			Yes Data Analytics			Average		
No Consulting	7.90	(1.63)	[29]	8.19	(1.78)	[31]	8.05	(1.70)	[60]
Yes Consulting	8.04	(2.19)	[28]	8.34	(1.82)	[32]	8.20	(1.99)	[60]
Average	7.96	(1.91)	[57]	8.27	(1.79)	[63]			

Panel B: ANOVA Results

Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)
Intercept	7885.059	1	7885.059	2276.925	0.000
Consulting	0.626	1	0.626	0.181	0.671
Data Analytics	2.738	1	2.738	0.791	0.376
Consulting * Data Analytics	0.001	1	0.001	0.000	0.987
Error	401.711	116	3.463		
Total	8327.000	120			

Relationship of the IAF with management (Process dimension)

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]

	No Data Analytics			Yes Data Analytics			Average		
No Consulting	7.10	(2.30)	[29]	6.32	(2.52)	[31]	6.70	(2.43)	[60]
Yes Consulting	6.96	(2.66)	[28]	8.09	(1.96)	[32]	7.57	(2.36)	[60]
Average	7.04	(2.46)	[57]	7.22	(2.41)	[63]			

Panel B: ANOVA Results

Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)
Intercept	6068.145	1	6068.145	1084.354	0.000
Consulting	19.920	1	19.920	3.560	0.062
Data Analytics	0.909	1	0.909	0.162	0.688
Consulting * Data Analytics	27.294	1	27.294	4.877	0.029
Error	649.147	116	5.596		
Total	6806.000	120			

Accuracy of the IAF's reports (Output dimension)

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]

	No Data Analytics			Yes Data Analytics			Average		
No Consulting	8.34	(1.37)	[29]	8.48	(1.71)	[31]	8.42	(1.54)	[60]
Yes Consulting	8.61	(1.17)	[28]	8.72	(1.73)	[32]	8.67	(1.48)	[60]
Average	8.47	(1.27)	[57]	8.60	(1.71)	[63]			

Panel B: ANOVA Results

Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)
Intercept	8724.694	1	8724.694	3756.164	0.000
Consulting	1.849	1	1.849	0.796	0.374
Data Analytics	0.470	1	0.470	0.202	0.654
Consulting * Data Analytics	0.006	1	0.006	0.002	0.961
Error	269.441	116	2.323		
Total	9027.000	120			

Relevance of IAF's recommendations (Output dimension)

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]

	No Data Analytics			Yes Data Analytics			Average		
No Consulting	8.00	(1.77)	[29]	7.77	(2.33)	[31]	7.88	(2.07)	[60]
Yes Consulting	8.36	(1.22)	[28]	8.88	(1.24)	[32]	8.63	(1.25)	[60]
Average	8.18	(1.53)	[57]	8.33	(1.93)	[63]			

Panel B: ANOVA Results

Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)
Intercept	8147.918	1	8147.918	2785.220	0.000
Consulting	15.898	1	15.898	5.434	0.021
Data Analytics	0.638	1	0.638	0.218	0.641
Consulting * Data Analytics	4.136	1	4.136	1.414	0.237
Error	339.348	116	2.925		
Total	8545.000	120			

Added-value of the IAF (Outcome dimension)

Panel A: Cell Means – Mean (Std. Dev.) [Cell Size]

	No Data Analytics			Yes Data Analytics			Average		
No Consulting	8.38	(1.32)	[29]	8.55	(1.36)	[31]	8.47	(1.33)	[60]
Yes Consulting	8.29	(1.74)	[28]	8.56	(1.61)	[32]	8.43	(1.66)	[60]
Average	8.33	(1.53)	[57]	8.56	(1.48)	[63]			

Panel B: ANOVA Results

Source	Sum of squares	Df	Mean square	F-ratio	p-value (two-tailed)
Intercept	8532.301	1	8532.301	3719.535	0.000
Consulting	0.047	1	0.047	0.021	0.886
Data Analytics	1.487	1	1.487	0.648	0.422
Consulting * Data Analytics	0.087	1	0.087	0.038	0.846
Error	266.094	116	2.294		
Total	8836.000	120			

Inter-item correlation matrix

N=120	Competence	Objectivity	Effective method.	Mgmt/IAF relationship	Accuracy reports	Relevance recom.	Added-value
Competence	1						
Objectivity	0.388***	1					
Effective method.	0.603***	0.426***	1				
Mgmt/IAF relationship	0.282***	0.016	0.257***	1			
Accuracy reports	0.622***	0.232**	0.497***	0.287***	1		
Relevance recom.	0.534***	0.196**	0.366***	0.272***	0.531***	1	
Added-value	0.723***	0.365***	0.584***	0.302***	0.585***	0.399***	1

** The Pearson correlation is significant at the 0.05 level (two-tailed)

*** The Pearson correlation is significant at the 0.01 level (two-tailed)

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