

HOW DOES **DIGITALIZATION**  
CHANGE THE ROLE  
AND WAY OF WORKING  
OF INTERNAL AUDIT:  
AN EXPLORATORY OVERVIEW

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# EXECUTIVE SUMMARY

New technologies are driving transformative changes in all industries. Organizations are adopting new ways of working – seeking more efficiency and ways to capture value. Technological improvements, especially the ability to automate tasks and processes, are also having a large impact on auditing. Technologies that are receiving significant attention in auditing are, among others, Robotic Process Automation (RPA), Predictive Analysis (PA) and Artificial Intelligence (AI).

IIA Netherlands in collaboration with EY, has conducted a study on how the Internal Audit Function (IAF) is using these digitalization technologies and how digital theory and methodology can be embedded best into the business practice of the IAF. The research also focused on how digitalization can impact risk identification, audit scoping, controls testing and management of risks for the IAF.

In addition to literature research, an online survey was conducted. A total number of 73 Internal Audit professionals responded, although the response differed per question; the minimum was 36. Thus, the results should be seen as directions and points of attention and not as 'mathematically hard' conclusions.

The study findings suggest that RPA, PA and AI have not profoundly found their way into the Internal Audit activities of Dutch IAFs yet. The results show that most respondents rate the usage of technology for Internal Audit activities as at least conservative. The main obstacles for the implementation of new technologies were stated as 'cost/level of effort for applying digitalization', 'lacking skills of IA employees' and 'technology related challenges'. Nevertheless, the urge is there to make use of new technologies and data to improve the effectiveness of the IAF.



## CHAPTER 1

## INTRODUCTION

The current humanitarian crisis has made it clear that we are living in a digital environment. This trend will only increase during the following years. Governments across the world institute nationwide lockdowns, which drives the demand for digital services and products, both for customers and employees working from home. Online business activities have increased significantly over the last year, and millions of employees are relying on remote collaboration tools and online processes to get work done (Zaveri, 2020). Digital solutions have been a subject of attention for many researchers. They are also an important topic for major consulting and advisory firms and government institutions (Tapscott, Mesebourg, Imlah, Negroponte, 2020).

Most probably, working in a digital environment will become the new normal (Eisenberg, Ledson, 2020). This presents an opportunity to review how companies (based in the Netherlands) are conducting their digital business. 'Digital' is a broad term that includes digital processes in the economy, using the internet, mobile technology and the 'Internet of Things'. Due to the broad range of the term 'digitalization', the focus in this paper will lie on how Internal Audit Functions (IAFs) are embedding 'digital' processes and tools to increase their value. This includes the adaptation of Artificial Intelligence (AI), Robotic Process Automation (RPA) and Predictive Analytics (PA). For a further definition of these practices see chapter 2 of this paper.

The research focused on understanding how digital theory and methodology are embedded into the business practice of IAFs of Dutch-based companies, concentrating on RPA and IA. The main objective of the research was to understand:

- The current digital environment within IAFs.
- The way this is influencing the role, way of working and effectiveness of IAFs.
- How IAFs are embedding digital processes and tools to increase their value.

In this research paper, the outcome of a preliminary research on PA, conducted by IIA Netherlands in cooperation with EY (not published), has also been included.

The research results give insights into the rate and way of digitalization within the IAF. Based on these results, good practices for effective and efficient use of new technologies are stated. While similar research on the digital IAF has been conducted in other regions, such as North and South America by Protiviti (2019), PwC (2019) and Asia by PwC (2018), this is the first research on digitalization of the IAF in the Netherlands.

## 1.1 RESEARCH QUESTION

The research is directed to the question:

'How does digitalization change the role and way of working of Internal Audit?'

To answer the main research question, the following sub-questions have been examined in this research:

1. What kind of digitalization can be useful for Internal Audit Functions?
2. To what extent do Internal Audit Functions regard digitalization as relevant for their activities today?
3. How do digital technologies such as Robotic Process Automation, Artificial Intelligence and Predictive Analytics impact Internal Audit activities today?
  - a. To what extent do Internal Audit Functions already use digital-related technologies?
  - b. How do Internal Audit Functions make use of digital technologies?
    - Who drove the implementation of these technologies?
    - What was the main reason to adapt the technologies?
    - What is the added value of the technologies for the Internal Audit Function?
  - c. If no, why not and are there any plans to implement new technologies to support the Internal Audit Function?
4. What are good practices for the adaption/ implementation of digitalization?
  - a. What are examples of successful implementations of technologies for the Internal Audit Function?
  - b. What are examples of failed implementations of technologies for the Internal Audit Function?
  - c. What are the main factors for a successful adaption?
  - d. What are major constraints not allowing a successful implementation of new technologies?
5. To what extent will Internal Audit Functions regard digitalization as relevant for their plans for future development and what is required for a successful adaptation?

## 1.2 RESEARCH METHOD

This research was conducted in three parts. The first part was a literature research (Appendix 1). The second part was a survey amongst IA professionals currently employed by Dutch-based companies (Appendix 2). The third part focused on combining the results and draw a conclusion.

Results and insights from the survey draw the picture of the current state of IA digitalization in the Netherlands. Based on that, conclusions are drawn for the future implementation of technologies in IAFs.

The following assumptions were leading the research:

- Most of the IAFs (>50%) are applying some sort of digitalization within their audits.
- A large part of IA professionals expect to increase their usage of RPA, AI and PA in their IAF.

This research was based on the following research model:

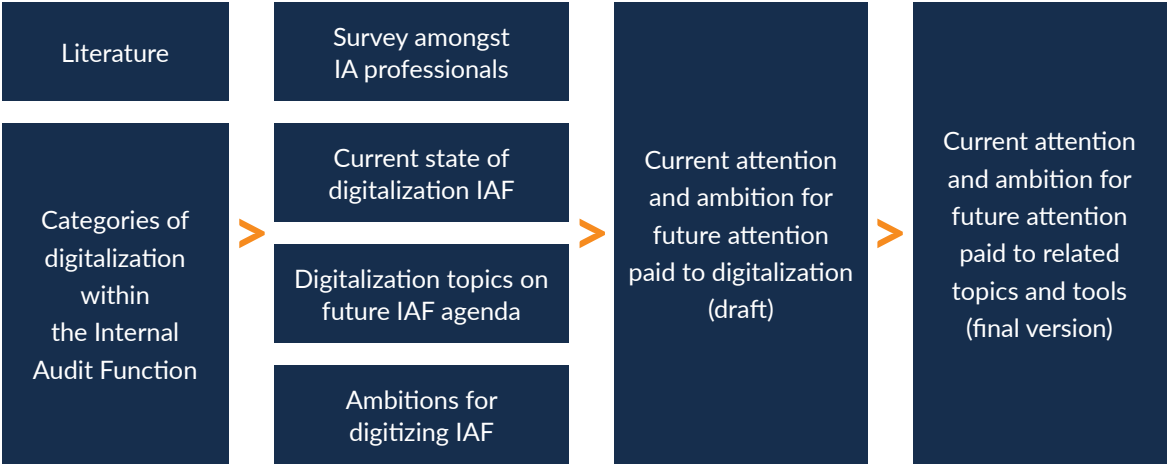


Figure 1 Research method

**1.2.1 Target audience**

This research was focused on Internal Audit Functions as a target audience as defined in the scope.

The results will be primarily relevant for Internal Audit professionals, regardless of industry. C-level management and the supervisory board (as a consumer of IAF output) could have interest in the results as well. Readers of this paper will gain insight into the current state of digitalization within IAFs and how various technologies are currently applied within IAFs. These insights can form a basis for the IAF’s technical roadmap.

**1.2.2 Scope and limitations**

The survey reflects perceptions among Internal Audit professionals. Hence the survey results represent their perception of reality. Responses are not compared with documentation, such as IAF audit programs and Audit Committee reports. This research focuses on organizations based in the Netherlands that have an IAF in place.

**1.2.3 Reading guide**

After the introduction in chapter 1, chapter 2 gives a literature background on the three practices selected as most important factors for digitalization, namely Artificial Intelligence, Robotic Process Automation and Predictive Analytics. With this, chapter 2 lays the basis for the first research question. Chapter 3 outlines the connection of the three digitalization practices with Internal Audit from a literature perspective and thereby also answers the first research question. Chapter 4 summarizes the current state of digitalization of Internal Audit based on the survey results. The data of the survey is used to answer research questions 2 and 3, partly also 4 and 5. Good practices have been collected based on a. the survey results, b. insights from EY Risk Consulting members and c. insights from the IIA Internal Audit Innovation Award. These good practices are stated in chapter 5.

## CHAPTER 2

# DIGITALIZATION

This chapter lays the literature foundation for answering the first research question: ‘What kind of digitalization can be useful for IAFs?’ It defines the three possible practices of digitalization this paper focuses on.

The term digitalization is used in different ways. But technologies are enabling any digital process. Digitalization hence can be defined as any digital technology or project management approach that is considering digital ways of working, such as cloud infrastructure, an Agile way of working, cyber security, IT systems analysis, electronic working papers and digital approvals.

In the business context of the IAF, the IIA defines two goals for digitalization in ‘Risk in Focus 2021’: “To enable the strategy of a company and to enhance its operations. From an operational standpoint, technologies such as automation, machine learning and Artificial Intelligence speed up processes, increase efficiency and reduce costs over the long term (i.e. once investment costs have been recovered) while removing the need for manual processing. Companies can also disrupt existing markets or create new ones by innovating digital and physical new technologies, ensuring their strategic relevance and securing their existence.” (The Institute of Internal Auditors Netherlands, 2020).

Digitalization of the Internal Audit Function is the main subject in this research paper. Since digitalization is a very broad subject, the focus lies on Artificial Intelligence, Robotic Process Automation and Predictive Analytics, because these topics

receive a lot of attention and limited research on these topics in the context of Internal Audit is available. In the following chapters these practices will be defined and connected to the area of Internal Audit.

### 2.1 ARTIFICIAL INTELLIGENCE

Artificial Intelligence did not originate from computers, but rather from “programmable electronics”. It can be regarded from different perspectives and the definition of Artificial Intelligence is not something completely new. In fact, it can be seen as a “branch of cognitive science” (Haugeland, 1989). Artificial Intelligence is considered a fairly old concept, since the 1950’s Alan Turing test. The scientist realized a test proving that a machine can be intelligent and manifest the identical communication behavior as a human (Carata et al., 2018).

As a definition, Artificial Intelligence relates to cognitive abilities to perform augmenting or simulating human thinking. Another perspective on Artificial Intelligence can be defined by means of application. These can be defined as “natural language processing, automatic programming, robots, intelligent data retrieval system” (Nilsson, 1971). A computer system can be said to have some sort of ‘artificial intelligence’ since these

systems have proven to perform the diagnosis of diseases, solve differential equations or even “understand limited amounts of human speech and natural language text” which are considered to demand “intelligence” (Nilsson, 1971). Most definitions of AI lead to the classification of four different types: “systems that think like humans, systems that act like humans, systems that think rationally, systems that act rationally” (Joost et al., 2013).

According to EY, Artificial Intelligence is not a single technology but a set of methods and tools with sub-domains applied to countless situations. “Technology is implemented. Bots are built. But AI is applied.” Value from AI does not come from “putting it in” – at least not yet. But AI is maturing and being embedded in enterprise systems or becoming more accessible for nontechnical users.” (EY (a), 2020). The exponential increase in the quantity and quality of available data has opened new possibilities for how data can be used by audit teams.

## 2.2 ROBOTIC PROCESS AUTOMATION

Robotic Process Automation can be described as the use of bots (autonomous computer programs) to automate repetitive, routine business processes (Cooper, Holderness, Sorensen, and Wood 2019, 2020).

The Institute of Electrical and Electronics Engineers Standards Association (IEEE SA) describes RPA as follows: “A preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management” (IEEE Corporate Advisory Group 2017). In short, RPA automates human tasks.

Today one cannot ignore that the nature of human work includes error. The risk of malfunction, fraud and errors is always higher in manual systems than in automated systems. Robots are consistent, tireless, and trustworthy. According to Kaya and Turkyilmaz and Birol (2019), robots can perform the same task the same way every time without error or fraudulence. According to their research, RPA optimizes capabilities that grow organizational capacity.

According to a case research of Kaya, Turkyilmaz and Birol (2019) one company was able to increase organizational productivity and capacity without extra recruiting or training after deploying automation software to support several IT processes. This company achieved many benefits of RPA solutions which go beyond cost reduction and include:

- Decreased cycle times, improved throughput, and efficiency.
- Flexibility, scalability, easiness in implementation and development.
- Improved FTE and employee morale and accuracy.
- Time to innovate and focus on customer satisfaction.

This is possible because RPA solutions:

- Can act on data from one or multiple sources in different formats.
- Manages, processes or interprets the data according to established rules.
- Can communicate results to another digital system, trigger another task on another system, or create an alert.



## 2.3 PREDICTIVE ANALYTICS

Predictive Analytics can be described as a set of business intelligence technologies that uncovers relationships and patterns within large volumes of data that can be used to predict behavior and events (Eckerson, 2007).

The vast majority of business analytics efforts are spent on predictive analytics with typical methodologies including machine learning, artificial simulation, and data mining. It helps organizations grasp the reasons of the events that happened in the past and understand relationships among different kinds of data, combining them and, as a result, determine the future (Lepeniotia, Bousdekisa, Apostoloua, Mentzasa 2020).

In business, Predictive Analytics is used to identify risks and opportunities, amongst which fraud detection. Julie Brown, COO and CFO of Burberry and Audit Committee Chair for pharmaceutical company Roche, explains: "With journal postings, for instance, you can search for entries over weekends, outside normal business hours, or by staff who wouldn't normally make them, to pick up signs of fraud or manipulation of the accounts." (EY (c), 2020).

## CHAPTER 3

# POSSIBLE DIGITALIZATION OF INTERNAL AUDIT

This chapter explores the opportunities how the three practices from the previous chapter could be deployed by the Internal Audit Function. This answers the first research question: 'What kind of digitalization can be useful for IAFs?'

According to the definition of Internal Audit by the Institute of Internal Auditors, "Internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes" (The Institute of Internal Auditors, 2020). In this systematic approach digitalization offers a lot of opportunities for Internal Auditors to improve the effectiveness of their function and add value to the business.

It is also important to note that digitalization should be part of the Internal Auditor's knowledge as he/she should gain sufficient knowledge of key information technology risks and controls and available technology, in line with IIA standard 1210.A3 (The Institute of Internal Auditors, 2016).

## 3.1 ARTIFICIAL INTELLIGENCE AND INTERNAL AUDIT

According to Carata, Spătariu and Gheorghiu (2018) Artificial Intelligence can be mainly grouped in four types and is applied in Internal Audit as follows:

- **Type 1 – Systems that think like humans:**  
"Reactive machines programed on responsive repetitive reactions, use for big data processing, and facilitate routine, manual tasks, replacing human repetitive actions to avoid mistakes. They are used since the Industrial Revolution (1920's), when machines started to replace labor in factories."
- **Type 2 – Systems that think like humans:**  
"Machines with limited memory, facilitate manual tasks, able to replace multiple processes, saving time and increasing efficiency."
- **Type 3 – Systems that think rationally:**  
"Machines with theory of mind, replace cognitive tasks, able to adjust their behavior according to people's thoughts, feelings, can respond to demands in an intuitive way – replacing humans in dangerous situations with robots and drones."
- **Type 4 – Systems that think rationally:**  
"*Self-aware machines*, using cognitive tasks can predict people's feelings and act accordingly, from sales to a disaster event."

Today, companies agree that AI will allow audit to be more effective, by providing more coverage and consistency. To achieve that, Internal Audit can “assess, comprehend and share the impact of the role of Artificial Intelligence in creating value for the company” (Carataş et al., 2018). On the road of computerization, Internal Audit is required to adapt to emerging risk areas, such as invalid data analytics, cybersecurity, regulation, politics, and talent management. It needs to provide added value and support on strategic and operational risks. Due to the changing environment, the individual responsible for Internal Audit needs to comprehend the basics of AI, to fully grasp possibilities and risks (Carataş et al., 2018).

According to the IIA, there are a few possible risks arising from Artificial Intelligence (The Institute of Internal Auditors, 2017):

- Artificial Intelligence might adopt human logic deviations or unknown tendencies in the technology.
- There are various ethic and reputational risk issues, for example when AI activities do not result in decisions and actions that are in line with the ethical, social, and legal responsibilities of the organization.
- There could be competition risks when not adopting AI - perhaps organizations will be left behind by competitors if they do not invest in AI.

EY states that “AI techniques – most prominently machine learning – allow to look at data using advanced pattern recognition and harness this functionality to digitally assist auditors by:

- Analyzing and extracting data from unstructured data, such as contracts, invoices, and images, to gain further audit evidence.
- Analyzing large data sets to help identify, assess and respond to the risks of material misstatement due to fraud” (EY (b), 2020).

### 3.2 ROBOTIC PROCESS AUTOMATION AND INTERNAL AUDIT

Today, Robotic Process Automation has been largely implemented by business organizations, ranging from automatic calculation of credit to a customer’s account, to automatic invoice processing (Seasongood, 2016), even though the application of RPA to auditing remains mainly unexplored. Given the recent interest by audit firms and standard setters about the use of technology in audits (IAASB 2016; PCAOB 2017a; KPMG 2016; PwC 2017), it is not surprising that RPA is emerging as an area of interest. From an auditing perspective, manual and repetitive audit tasks such as reconciliations, internal control testing, and detail testing can be automated. As a result of this automation, auditors would be able to allocate more resources to audit areas that are complex in nature, such as estimation of fair value investments.

It is not a secret that an automated audit workplace will change the role of an auditor tremendously. Many manual and time-consuming process jobs will be replaced with technology and auditors can find a chance to focus on strategies and analyses (Seasongood, 2016). Transactional tasks will move to integrated business services solutions that use robotics, and that will automate or eliminate up to 40% of transaction audit work. Automation not only improves the time efficiency of auditors, but also creates real-time access to financial data, so that reporting and analysis can be done simultaneously and continuously. On the other hand, RPA is not replacing auditors, it evolves their job in a progressive, and positive way and enables them to focus on the greatest value they can provide to their organization (Axson (2015), Spanicciati (2016).

So, what are the benefits of RPA for auditors? Firstly, auditors will benefit from robotics in regular internal control activities. As an example, if required controls are missed or any action does not fit the programmed rules, a robot automatically flags the transaction, and warns the auditor for reviewing and searching more in depth. This will help the auditor to save time, act proactively and, focus on the more analytical side of their job as seen in the finance function. Secondly, RPA will also serve for risk management, and it is expected to decrease fraud risk as well as human errors (Vasarhelyi et al., 2018).

### 3.3 PREDICTIVE ANALYTICS AND INTERNAL AUDIT

It is not surprising that the real game changers are new practices such as Predictive Analytics, because they offer far-reaching insight to companies. In addition, Predictive Analytics specifically is transforming the way audits are conducted, because it enables auditors to move away from auditing small samples of data to auditing large samples, or even entire datasets that can be extracted by the company (Eckerson, 2007).

Even though Predictive Analytics has gained a critical role in today's business environment, deployment of PA in Internal Audit includes various challenges. One of the major obstacles is gathering qualified and reliable data. Organizations that use Predictive Analytics have difficulties to identify data that really matters. Too often IA is accused of telling the business what they already know. Embracing Predictive Analytics will enable real-time identification of issues instead of more reactive approaches. Continuous data collection and analysis across both internal and external data sets (risk and operational data) will drive predictive capabilities and risk-informed decisions aligned to strategic priorities. This will be enabled through integration of technology into an ecosystem that is primed to provide insights. Further-

more, analytics-based testing will shift the focus from traditional sample-based audit procedures to data analysis and the identification of key risk indicators. This will make sure that Internal Audit moves away from audit plans based on (semi) annual risk assessments and moves toward risk-reaction campaigns.

A shift in audit towards real time reporting and monitoring needs a fundamental change in the way audit results are communicated to the stakeholders. Traditional Internal Audit reporting will be replaced by short, sharp video communications and live dashboards which pull from digitalized Internal Audit evidence and results. In the coming age of close to real time auditing and control, auditors and management not only want to verify past activities, but they also want to prevent faulty transactions and predict future events for improved control. It can be concluded that the predictive audit is an emerging concept that could fulfill this vision (Kuenkaikaew, Vasarhelyi, 2012).

According to Kuenkaikaew and Vasarhelyi (2012) a Predictive Audit could strengthen the control environment of a company and create better feedback mechanisms for management. Flagged transactions could be examined to determine if they are allowable. If not allowable, they could be subjected to further investigation. From the literature research can be concluded that Artificial Intelligence, Robotic Process Automation and Predictive Analytics are indeed useful digitalization practices for IAFs.

## CHAPTER 4

# CURRENT STATE OF DIGITALIZATION OF INTERNAL AUDIT

To collect data supporting the research on the current state of digitalization of the IAF, an online survey was conducted. The survey data is used to answer research question 2 and 3, partly also 4 and 5.

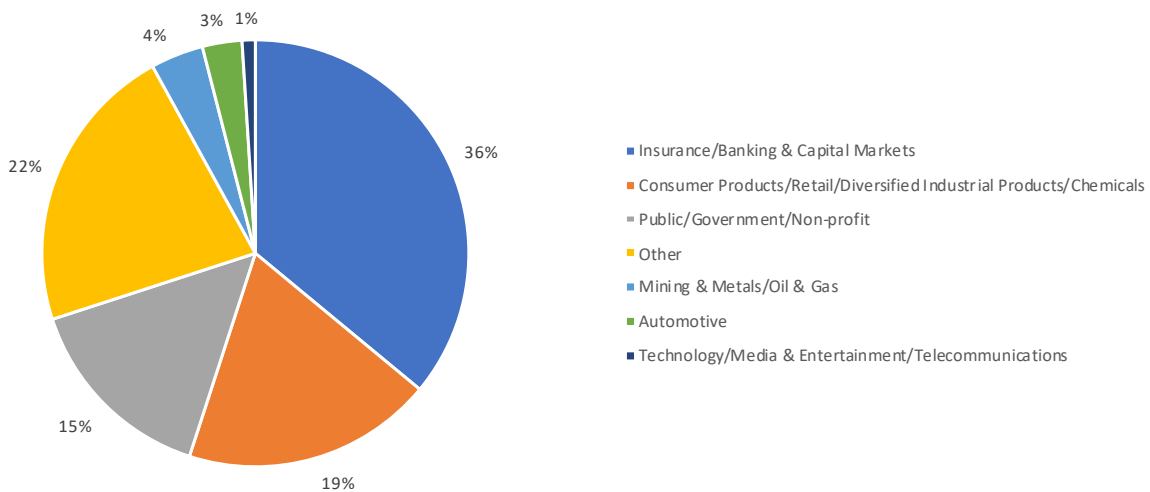


Figure 2 What is your industry?

Summarizing the participants' profile, most respondents (74%) are part of a company employing more than 1001 individuals. 11% of respondents work for a company that employs between 501-1000 individuals. Regarding the size of func-

tion, the majority of respondents are part of an Internal Audit Function with 2-5 employees (36%) and more than 10 employees (36%). 17% of the respondents are part of an Internal Audit Functions with 5-10 employees.

### Drivers for digitalization

The main drivers for digitalization of the IA role and activities (both for annual planning as well as actual audit engagements) are:

1. Developing insights for the design and effectiveness of existing internal controls (77%)
2. Developing insights for the effectiveness of existing risk indicators (47%)
3. To uncover unknown fraud patterns in transactions (39%).

Other main drivers to digitalize the function are compliance and regulatory requirements (29%) and others (17%), which mainly includes ‘increasing efficiency’ but also ‘the need to digitize the

function since the rest of the company pays a lot of attention to digitalization’ as well as ‘prediction in risk events’.

The goal was to find out if drivers for the digitalization of risk management activities differ from the drivers for the Internal Audit Function itself. This could suggest whether the digitalization practices are driven by different forces within companies and whether digitalization for IA purposes has been placed on the agenda in general. The answer is: not really. Using digitalization to ‘develop insights for the effectiveness of existing risk indicators’ was named most often (67%) as a driver to digitalize.

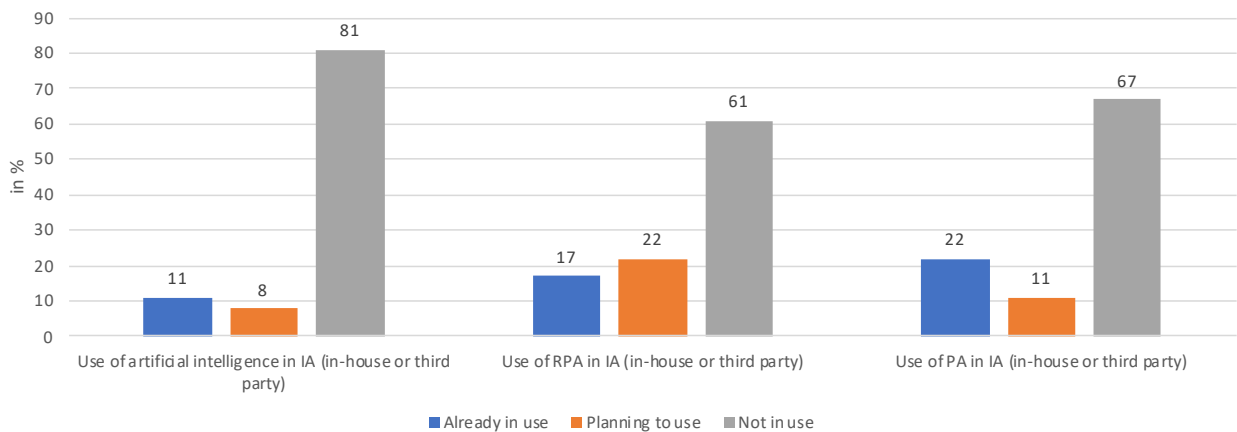


Figure 3 Use of technologies within IAF

### Actual use of digitalization

It became clear that the use of the three digitalization practices within IAFs is rather limited at the moment.

Besides AI, RPA and PA, several other technologies were described by the respondents as used or planned to use within their IAF, such as different software tools with regards to audit management. The most common answer was related to the use of Data Analytics.

Looking at the time frame for the companies already applying some sort of digitalization, 50% have been using it between 1 and 3 years. 28% stated these were in use for less than a year. 14% have been applying them between 4 and 6 years and 8% for more than 7 years. So, we may conclude that the application of digitalization is a rather new development.

The key user of digitalization of the Internal Audit Function is primarily the Internal Audit

department itself (75%). Further users might be the Operations Department (22%) and the Finance Accounting Department (19%). The CFO (17%), Data and Analytics Department (14%) and CEO (11%) followed. This means that the biggest user group of digitalization would be the Internal Audit Function. Other functions could make use of digitalization in the sense of reporting support or dashboarding.

The three practices are almost equally used by the Internal Audit Function:

- Robotic Process Automation: 34%
- Artificial Intelligence: 30%
- Predictive Analytic: 29%

For auditing processes, Purchase-to-Pay (P2P) (44%), Order-to-Cash (36%) and Treasury (28%) were named as the main processes in which digitalization tools are applied.

When it comes to the way how digitalization of the Internal Audit has been developed, 17% stated that the beginning is Data Analytics. A further way of developing the function is by 'trial by error' (14%). Also, hiring experts on the topic or data minded audit staff (14%). However, around 32% of the respondents noted that digitalization has not

yet been developed within the IAF. The responses of the remaining 23% could not be grouped around specific topics. Responses include for example 'audit management system' or 'starting to investigate'.

In case the function has been faced with digitalization or plans to do so, 51% of respondents state this happened under the responsibility of the Internal Audit Function itself. 23% state that the Board and/or (middle) management has been responsible for the implementation of digital ways of working for Internal Audit. The free field option was selected by 26% of the respondents. Many of them stated the CAE as main responsible for implementing digital ways of working for Internal Audit.

### Obstacles of digitalization

The main obstacle in using digitalization, named by 61% of the respondents, is the cost/level of effort for applying digitalization. As a next obstacle, missing skills of IA employees was named by 47% of the respondents. 39% relate the obstacle to technology-related challenges. Also, data availability was stated by 28% of the respondents. So, in general one could say that the obstacles in using digitalization relate to a lack of effort and a lack of skill.

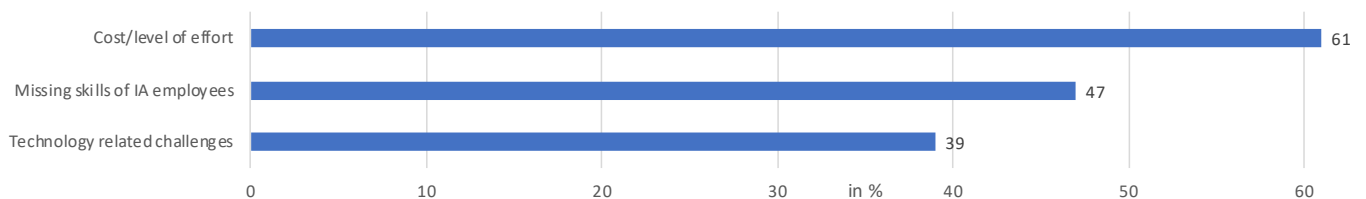


Figure 4 What are the top 3 obstacles/limiting factors faced by using digitalization tools or methods?

**Key success factors of digitalization**

The most important key success factor for the enablement of the digitalization is stated as data availability, quality, governance, privacy laws. As second most important factors, with medium importance, business case content as well as interpretation, visualization and communication of results and are named. As the third success factor, with low importance, budget availability together with business case content were stated as relevant. Looking at the results of the importance rating one can say that the context of success factors is complex. Please refer to the table for the full results.

The participants were also asked to rate the IAF's understanding regarding the development of IT Internal Audit architecture. The majority stated the IA department had an average understanding (67%). 28% rated its understanding as clear and 6% stated that the IA department had no understanding of the IT Internal Audit architecture development. Hence, the majority rated the knowledge at least as average.

	High importance	Medium importance	Low importance
Data availability, quality, governance, privacy laws	86%	14%	0%
Accuracy, fit of predictive model	39%	56%	6%
Internal people (skill, expertise)	69%	28%	3%
Budget availability	42%	42%	17%
Technologies/tools/infrastructure	44%	53%	3%
Business case content	25%	58%	17%
Interpretation, visualization, communication of results	42%	58%	6%

Figure 5 Key success factors that enable the digitalization processes

**System landscape**

When it comes to the use of different technologies within the respondent's company (the system landscape), 53% state that the system landscape is very heterogenous (different systems for significant parts of Internal Audit-relevant business processes, data were merged for relevant evaluations). Largely heterogeneous (different systems for significant parts of Internal Audit-relevant business processes, connected to ERP system via interfaces) as well as largely homogeneous (fully integrated solutions and independent sub-systems for individual relevant business

processes, connected to ERP system via interfaces) were named by both 22% of respondents. One respondent stated systems to be very homogeneous (fully integrated solutions for all key Internal Audit-relevant business processes). The results indicate that the majority shows different systems for significant parts of the internal audit-relevant business processes and only a few responses suggest that solutions within the company are fully integrated.

Figure 6 shows the responses with regards to the use of technology in the company.



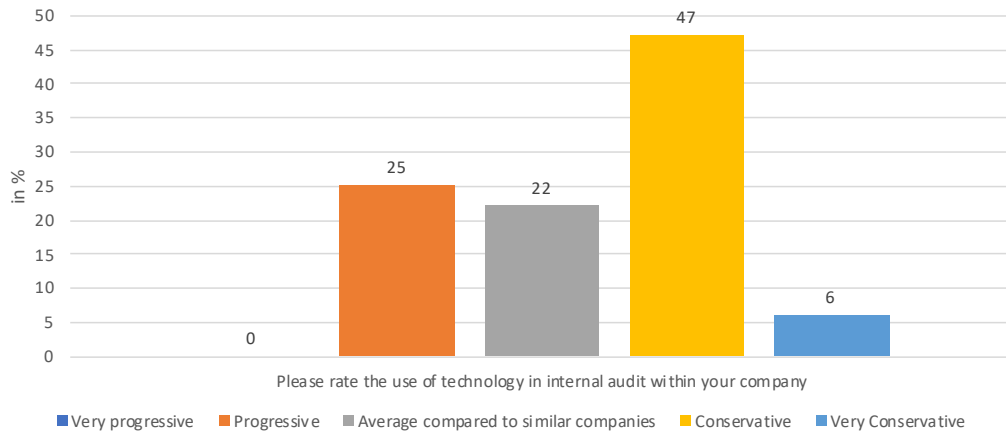


Figure 6 Usage of technology within IA

### Outlook on digitalization

To get a view on the future of digitalization, an estimate of the future degree of automation of Internal Audit activities was inquired in the survey. One explanation for the rather low degree of expected automation could be that human beings are still expected to be performing the audit role, but digitalization will increase effectiveness and efficiency.

The current impact of digitalization of IAFs as resulted from the survey is used in the following chapters, to draw an outlook on Internal Audit as well as to draw an overall conclusion.

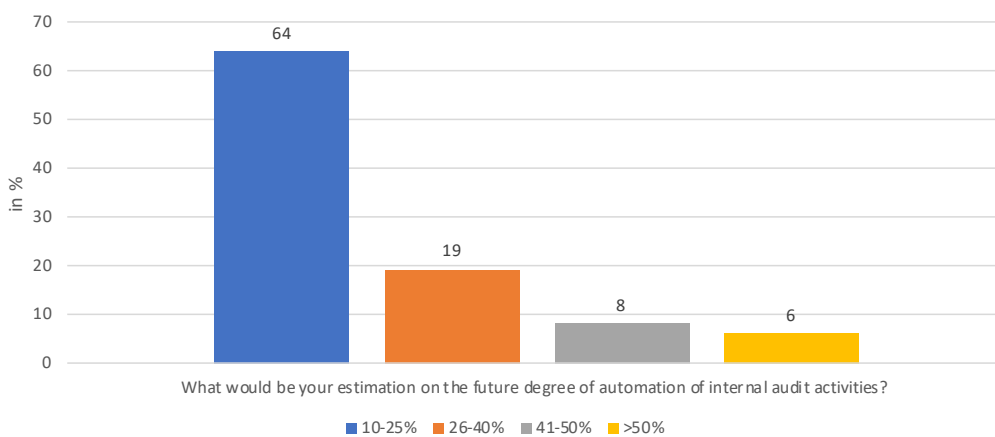


Figure 7 Estimate of the future degree of automation of Internal Audit activities

## CHAPTER 5

# GOOD PRACTICES FOR DIGITALIZATION OF INTERNAL AUDIT

Good practices have been collected based on a. the survey results, b. insights from EY Risk Consulting members and c. insights from the IIA Internal Audit Innovation Award. These good practices are summarized in three topics: Data Analytics, Robotic Process Automation and Predictive Analytics.

## 5.1 DATA ANALYTICS

### EY – Good practices in Data Analytics 2019

A major consumer product company decided to set up a digitalized global audit function. As part of that roll-out the company decided to utilize data analytics and create a data analytics team. According to the company, the data analytics team is an integral part of the success of Internal Audit, by ensuring that IA continues to be digitally proficient. This is achieved by delivering highly relevant risk and control related insights to internal and external stakeholders. The IA analytics objectives and assumptions enabling this vision are:

- Focus on improving operating model related risk insights - compliance will follow.
- Increase risk coverage through data driven scoping and sampling - focus on risks that matter and thereby get to the core of business challenges and opportunities.
- Increase resource efficiency and elimination of wasted resource utilization through smaller scopes with bigger risk coverage.

- Develop a talent hub that builds high performing individuals and creates the platform for future business leaders within the group.

Across the Internal Audit lifecycle, the data analytics team could provide value by supporting risk identification, risk monitoring, policy compliance, scoping, issue identification, sample selection, root cause analysis as well as reporting. Summarizing good practices with regards to analytics:

1. Include quantified risk exposures via analytics in audit reporting.
2. Adhere to data quality protocols (check data completeness, accuracy and quality) to deliver relevant and accurate insights.
3. Ask support from and commitment to analytics from the CAE and use IA tools such as the IA charter, mandate, metrics, etc.
4. Train Internal Auditors on using IA data analytics results.
5. Create a continuous improvement cycle for analytics results based on feedback.

### **Wessanen – Data analytics & Process Mining in Internal Audit (Internal Audit Innovation Award 2019)**

This case describes that in traditional audit, auditors can only provide reasonable assurance that processes are executed within the predefined set of boundaries. With process mining, there is no need for sampling data, as the company can use all the information recorded in the process and apply data analytics. In addition, process mining techniques help identifying discrepancies between a process execution and the desired process. With process mining, performing an audit can happen much faster and with more reliability. This case shows that process mining can be combined with data analytics since it is fact-based, covers full data set and shows depth of expected issues. Furthermore, process mining will shift the focus from traditional sample-based audit procedures to data analysis and the identification of not just effective controls, but also inefficiencies.

## **5.2 ROBOTIC PROCESS AUTOMATION**

### **Heineken - Robotics combined with Advanced Analytics (Internal Audit Innovation Award 2018)**

This case describes the overall problem statement that traditional audit sampling is very time consuming and subject to intensive manual work. In addition, audit sampling of, for example, expenses, are limited to a random selection, which covers only around 5-10% of the population. Heineken

suggests a potential solution that indicates: “With the use of Robotics and Optical Character Recognition (OCR) combined with Advanced Data Analytics, we can create a ‘Zero Touch’ automated workflow, which can increase the sampling size to 20-90% of the total population and advise the Audit team by exceptions (fraud/suspicious activities).” This would be a major win for audit professionals since the increased sampling size covers a larger and more visible population, and this can lead to, for example, more impact of conclusions or mitigation actions.

### **EY - Robotic Process Automation (Internal Audit Innovation Award 2019)**

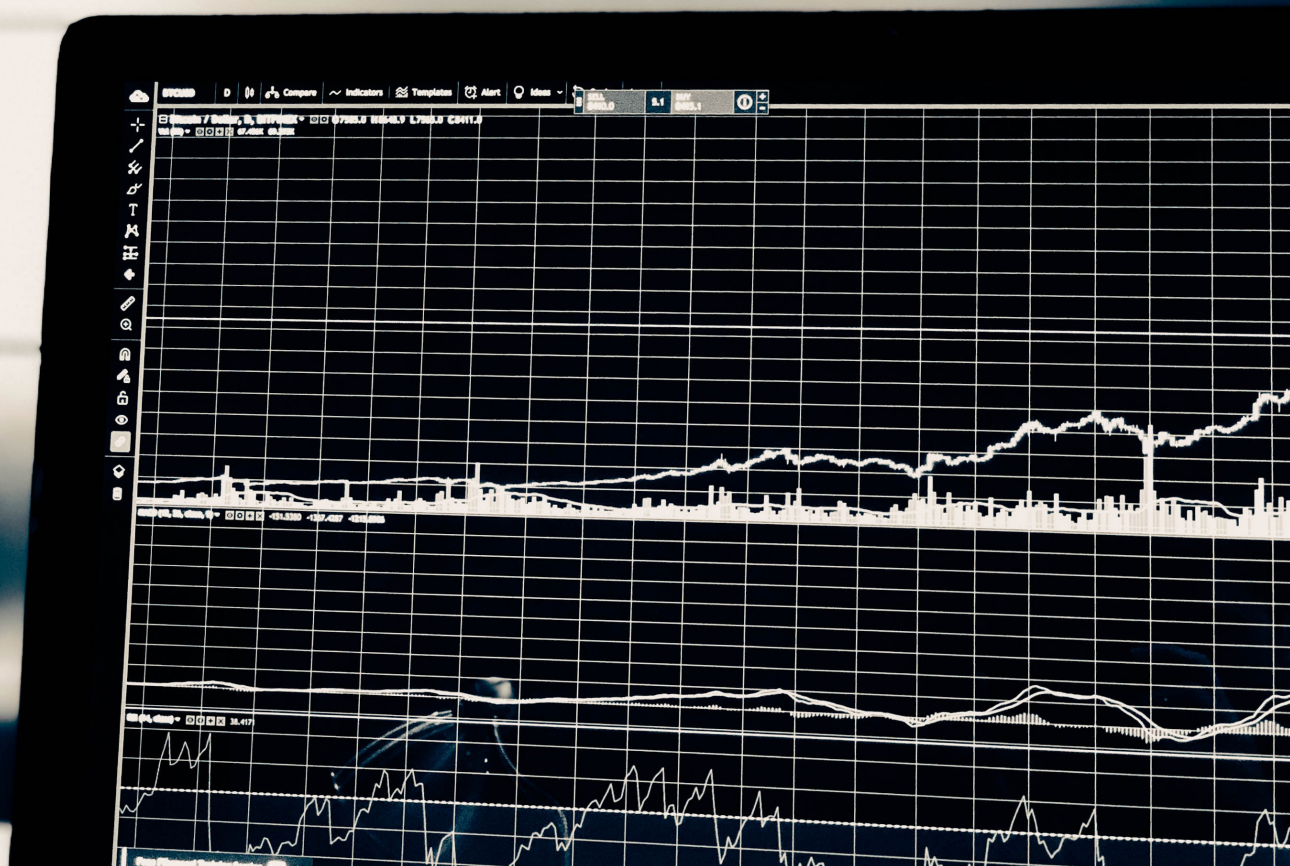
RPA indicates that the future of the IA department is being an air traffic control center, where analytics will enable confident decision making. EY believes that RPA, PA and AI can transform the Internal Audit Function into a digitalized function with people managing a series of dashboards, for example for risk assessments and scoping sessions in preparation for the audit planning. The disruptive age may be introducing new risks, but it is also introducing huge opportunities for IAFs. Internal Audit will undergo digitalization, have a flexible people model with new skills, and a more dynamic approach that is geared to giving timely insights on strategic risks. The new operating process model will feature an agile and dynamic process, empowered by technology that allows the function to respond to the evolving risk landscape. This will be enabled through integration of technology, for example RPA into an ecosystem that is primed to provide insights into the digitalization of the Internal Audit Function.

### 5.3 PREDICTIVE ANALYTICS

#### EY – Outlook for Internal Audit & Predictive Analytics (2019, unpublished)

Predictive Analytics arms the Internal Audit Function with real time risk intelligence that enables IA to fulfill its mandate of being a strategic advisor. Too often IA is accused of telling the business what they already know. Embracing predictive analytics will enable real-time identification of issues over more reactive approaches. Continuous data collection and analysis across both internal

and external data sets (risk and operational data) will drive predictive capabilities and risk-informed decisions aligned to strategic priorities. This will be enabled through integration of technology into an ecosystem that is primed to provide insights. Furthermore, analytics-based testing will shift the focus from traditional sample-based audit procedures to data analysis and the identification of key risk indicators. To meaningfully integrate predictive analytics across Internal Audit, a clear understanding of business objectives and alignment with the internal audit strategy is crucial.



## CHAPTER 6

# CONCLUSION

The use of Artificial Intelligence, Predictive Analytics and Robotic Process Automation in Internal Audit can reduce the dependency on human work, reduce costs and increase efficiency in business operations, but using these digitalization practices is only just starting to develop. The effects of digitalization on the auditors' working methods are more prominent than on the tools. This is mainly because a lot of digital tools are already implemented, since the profession is moving towards being fully paperless and auditors have experience with these tools. While more flexible working methods supported by digitalization are only developing.

Businesses, for a variety of reasons, still benefit from traditional audits, but modern analytics and computer technologies have allowed the performance of more than just backward assurance. The key factors in successfully implementing digital technologies are identified as data availability and data quality, governance, and privacy laws. Next to that, interpretation, visualization and communication of the results are crucial. The main obstacle for applying digitalization seems to be the cost/level of effort. Another relevant obstacle is the lack of skills of Internal Audit employees combined with technology-related challenges. Despite the stated relevance of digitalization for the Internal Audit Function, the concrete changes that can be expected in the future are yet unclear.

Looking at the impact today, IAFs use AI, RPA and PA at a minimal level, but they do pursue other digitalization efforts. Most common is the utilization of data analytics. For most of respondents the implementation was driven under the responsibility of the Internal Audit department itself. The

main reason to adapt technologies was stated as developing insights for the design and effectiveness of existing internal controls. Developing insights for the effectiveness of existing risk indicators was also an important driver, in combination with unknown fraud patterns in transactions.

Based on literature research and responses received, RPA will be likely to improve error-free and accurate transactions in accounting and increase the efficiency and effectiveness in monitoring and standard, repetitive auditing transactions. Further, the evolution of robotics will be used in the business processes in the nearby future. Also, predictive analysis is a good strategy to predict future events for improved control and faulty transaction prevention purposes. The predictive audit is an emerging concept that could positively impact this vision, create better feedback mechanisms for top management, and strengthen the control environment of the business. The digitalization of Internal Audit is an ongoing development and in the next ten years one must see and experience how this development will be further incorporated.

## NEXT STEPS

This research can be helpful for upcoming studies, by closing the gap between theoretical possibilities and practical application, through the increased understanding of the digitalization of the Internal Audit Function it provides. This understanding is conditional for the audit practitioners and other researchers to explore the possibilities of digitalization.

## APPENDIX 1

# SOURCES

### LITERATURE SOURCES

- Anderson, U. L., Christ, M. H., Johnstone, K. M. & Rittenberg, L. (2010). *Effective Sizing of Internal Audit Departments*. s.l.: The Institute of Internal Auditors Research Foundation (IIARF)
- Artificial Intelligence: Definition, Trends, Techniques and Cases*, *Encyclopedia of Life Support Systems (EOLSS)*, p. 2
- Axson, David (2015), *Dealty Digital: Good-Bye to Finance as You Know it*
- Bartlett, G. D., Kremin, J., Saunders, K. K. & Wood, D. A. (2017). *Factors Influencing Recruitment of Non-Accounting Business Professionals into Internal Auditing*. *Behavioral Research in Accounting*, pp. 119-130
- Carataş, Spătariu and Gheorghiu (2018), *“Ovidius” University Annals*, Economic Sciences Series Volume XVIII, Issue 1 /2018, p. 441-443
- Cooper, L. A., D. K. Holderness Jr., T. L. Sorensen, and D. A. Wood (2019). *Robotic process automation in public accounting*. *Accounting Horizons* 33 (4): 15–35
- Cooper, L. A., D. K. Holderness Jr., T. L. Sorensen, and D. A. Wood (2020). *Perceptions of robotic process automation in public accounting: Do firm leaders and lower-level employees agree?* Working paper. West Virginia University, West Virginia University, West Virginia University, and Brigham Young University
- Deloitte UK (2017), *“The roots are here – meet your digital workforce-Robotic Process Automation”*. Morgan Kaufman Publishers
- Haugeland, John (1989). *Artificial Intelligence. The Very Idea*. The Massachusetts Institute of Technology
- Joost N. Kok, Egbert J. W., Boers, Walter A., Kusters, Peter, van der Putten and Mannes Poel. (2013) *Artificial Intelligence: Definition, Trends, Techniques and Cases*
- Kaya, Turkyilmaz and Birol (2019), *Impact of RPA Technologies on Accounting Systems*
- Kuenkaikaew, Vasarhelyi (2012), *The Predictive Audit Framework*
- Lepeniota, Bousdekisa, Apostoloua, Mentzasa (2020), *Prescriptive analytics: Literature review and research challenges*, *International Journal of Information Management*
- Nilsson, Nils J. (1971). *Principles of Artificial Intelligence*. Morgan Kaufman Publishers
- Zuboff, S. (1988). *In the age of the smart machine: the future of work and power*. New York: Basic Books

## WEBSITE SOURCES

- Brennen, Scott J.; Kreiss, Daniel (23 October 2016), Digitalization, In: <https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118766804.wbiect111>
- Bloomberg, Jason (April, 29th 2018), Digitization, Digitalization, And Digital Transformation: Confuse Them At Your Peril. In: [https://moniquebabin.com/wp-content/uploads/articulate\\_uploads/Going-Digital4/story\\_content/external\\_files/Digitization%20Digitalization%20and%20Digital%20Transformation%20Confusion.pdf](https://moniquebabin.com/wp-content/uploads/articulate_uploads/Going-Digital4/story_content/external_files/Digitization%20Digitalization%20and%20Digital%20Transformation%20Confusion.pdf) from <https://www.forbes.com/sites/jasonbloomberg/2018/04/29/digitization-digitalization-and-digital-transformation-confuse-them-at-your-peril/#78e677fd2f2c>
- Chartered Institute of Internal Auditors UK (31 August 2017), The role of internal audit in digitalization. In: <https://www.iaa.org.uk/resources/technical-blog/the-role-of-internal-audit-in-digitilisation/>
- Eckerson, Wayne W. (2007) PREDICTIVE ANALYTICS-Extending the Value of Your Data Warehousing Investment, p. 5. In: [https://www.researchgate.net/profile/Waranpong\\_Boonsiritomachai/publication/307571066\\_Exploring\\_business\\_intelligence\\_and\\_its\\_depth\\_of\\_maturity\\_in\\_Thai\\_SMEs/links/585017a708ae4bc8993b6696/Exploring-business-intelligence-and-its-depth-of-maturity-in-Thai-SMEs.pdf](https://www.researchgate.net/profile/Waranpong_Boonsiritomachai/publication/307571066_Exploring_business_intelligence_and_its_depth_of_maturity_in_Thai_SMEs/links/585017a708ae4bc8993b6696/Exploring-business-intelligence-and-its-depth-of-maturity-in-Thai-SMEs.pdf)
- Eisenberg, Richard (Apr 10, 2020), Is Working From Home The Future Of Work? In: <https://www.forbes.com/sites/nextavenue/2020/04/10/is-working-from-home-the-future-of-work/> (18-5-2020)
- EY (a), 2020, AI, In: [https://www.ey.com/en\\_nl/ai](https://www.ey.com/en_nl/ai) (22-5-2020)
- EY (b), 2020, Audit innovation, In: [https://www.ey.com/en\\_nl/audit/innovation](https://www.ey.com/en_nl/audit/innovation) (22-5-2020)
- EY (c), 2020, How technology is helping audit committees to see the bigger picture, In: [https://www.ey.com/en\\_nl/assurance/how-technology-helping-audit-committees-see-bigger-picture](https://www.ey.com/en_nl/assurance/how-technology-helping-audit-committees-see-bigger-picture) (22-5-2020)
- Gartner Inc. (2020), Digitalization, In: <https://www.gartner.com/en/information-technology/glossary/digitalization>
- Ledsom, Alex (May 17, 2020) Working From Home Set To Become New Normal In France. In: <https://www.forbes.com/sites/alexledsom/2020/05/17/working-from-home-set-to-become-new-normal-in-france/#744ce65d3269> (18-5-2020)
- Presentation IIA 2018 Heineken <https://www.iaa.nl/SiteFiles/Nieuws/IAIA%202019%20Heineken%20Robotics%20combined%20with%20Advanced%20Analytics.pdf>
- Presentation IIA 2019 Wessanen <https://www.iaa.nl/SiteFiles/Nieuws/IAIA%202019%20Wessanen%20Process%20Mining%20in%20Internal%20Audit.pdf>
- The Institute of Internal Auditors (2020), Definition of Internal Auditing, In: <https://global.theiia.org/standards-guidance/mandatory-guidance/Pages/Definition-of-Internal-Auditing.aspx> (18-5-2020)
- The Institute of Internal Auditors (2017), "Global Perspectives and Insights", Artificial Intelligence – Considerations for the Profession of Internal Auditing, Special Edition, Part 1. In: <https://na.theiia.org/periodicals/Public%20Documents/GPI-Artificial-Intelligence.pdf>
- The Institute of Internal Auditors Netherlands (September 2020), RISK IN FOCUS 2021: Hot topics for internal auditors, p. 19. In: <https://www.iaa.nl/risk-in-focus-2021-hot-topics-for-internal-auditors>
- The Institute of Internal Auditors (2016) , "INTERNATIONAL STANDARDS FOR THE PROFESSIONAL PRACTICE OF INTERNAL AUDITING (STANDARDS)". In: <https://na.theiia.org/standards-guidance/public%20documents/ippf-standards-2017.pdf>
- Zaveri, Paayal (30 April 2020), Microsoft Teams now has 75 million daily active users, adding 31 million in just over a month. In: <https://www.businessinsider.nl/microsoft-teams-hits-75-million-daily-active-users-2020-4?international=true&r=US> (18-5-2020)

## APPENDIX 2

# SURVEY QUESTIONS

The survey first asks participants about some general characteristics of their organization and the IAF. Subsequently, they were presented with a number of subcategories (topics) per category related to digitalization of the IAF and asked for each of these digitalization related topics to what extent the IAF applies these in their daily activities and how much attention the IAF wants to see paid to it in the future (ambitions). We then gain insight into the topics that already get attention, but also which topics receive no or little attention at present. Lastly, the survey asks questions about the future of the IAF in general in the opinion of the respondents. They responded to the survey results from their perspective on the topic.

The following questions were used.

### I. General questions

#### 1. What is your industry?

- Insurance/ Banking & Capital Markets
- Technology/Media & Entertainment/Telecommunications
- Consumer Products/ Retail/ Diversified Industrial Products/ Chemicals
- Mining & Metals/ Oil & Gas
- Automotive
- Public/Government/Non-profit
- Other

#### 2. What is your company's annual revenue?

- <€0.1 Million
- €0.1 - 0.24 Million
- €0.25 - 0.49 Million
- >€0.5 Million

#### 3.1 What is the number of employees in your company?

- <100
- 101-250
- 251-500
- 501-1000
- 1001-5000
- 5001-10000
- >10000



### 3.2 How big is the IA Function in your company?

- 1
- 2-5
- 5-10
- >10

## II. How does digitalization impact the role of internal audit?

### 4.1 What are the most important drivers for digitalization adoption of the organization's internal audit role and activities - both for the annual plan purposes and for actual audit engagements?

- Compliance and regulatory requirements
- Develop insights for the effectiveness of existing risk indicators
- Develop insights for the design and effectiveness of existing internal controls
- To uncover unknown fraud patterns in transactions
- Other (please specify)

### 4.2 What are the most important drivers of the organization's digitalization of Risk Management activities - both for the annual ERM purposes and for periodic RM assessments / reporting?

- Compliance and regulatory requirements
- Develop insights for the effectiveness of existing risk indicators
- Develop insights for the design and effectiveness of existing internal controls
- To uncover unknown fraud patterns in transactions
- Other (please specify)

## III. How is digitalization (for example RPA, AI, PA) applied/ experienced by the companies? -- 'Status quo'

### 5.1 Use of artificial intelligence in IA (in-house or third party)

- We already use AI
- We are planning to use AI
- We are currently not using AI

### 5.2 Use of RPA in IA (in-house or third party)

- We already use RPA
- We are planning to use RPA
- We are currently not using RPA

### 5.3 Use of PA in IA (in-house or third party)

- We already use PA
- We are planning to use PA
- We are currently not using PA

- 5.4 Other technologies used within IA or planned to use (please specify here)
6. For how long has your organization adopted digitalization technologies/ tools?
- For less than a year
  - For 1-3 years
  - For 4-6 years
  - For 7 or more years
7. In your company, what business functions/ executives are the key users of the organization's digitalization of the Internal Audit Function?
- CEO
  - CFO
  - Internal Audit Department, Internal Control and Risk Management
  - Operations Department
  - Data and Analytics Department
  - Finance Accounting Department
8. Which specific digitalization technologies are applied for internal audit activities?
- Robotic Process Automation (E.g. Software, Communication with auditor...)
  - Artificial Intelligence (E.g. Optical Character Recognition (OCR), Document recognition...)
  - Predictive Analytics (E.g. TensorFlow, Chatbots, Node...)
  - Blockchain (E.g. Ensuring data integrity, Contracts...)
  - Other (please specify here)
9. In the audit of which processes are digitalization tools or methods applied?
- Purchase-to-Pay
  - Order-to-Cash
  - Human Resources
  - Inventory
  - Treasury (cash collection, cash and liquidity forecast)
  - Others (please specify)
- 10.1 How did you develop digitalization in your Internal Audit Function?  
Please summarize the development experience of implementing predictive analytics in your function briefly
- 10.2 Who was responsible for implementing digital ways of working for internal audit?
- Board/management
  - Middle management
  - Department

**10.3 What was the purpose of introducing these technologies for the IA activities?**

- AI Detecting anomalies?  
Identifying process vulnerabilities?  
Checking simulations of forecasts?
- RPA Standard business transactions?  
Data analysis?
- PA Data analysis?
- Others (please specify)

**10.4 Is IA applying verification using digitally signed documents?**

- Yes, largely
- Yes, partly
- No

**11. What are the top 3 obstacles/limiting factors faced by using digitalization tools or methods?**

- Adding value to the business
- Privacy and ownership of data
- Timeliness of data availability
- Cost/level of effort for applying digitalization
- Lack of transparency in models
- Technology-related challenges
- Integration of all risk related functions
- Operational effectiveness
- No market maturity for existing products
- Missing skills of IA employees
- Others (please specify)

**12. Please rank each of the following key success factors that enable your digitalization processes and tools capabilities based on criteria high importance, medium importance, low importance:**

- Data availability, quality, governance, privacy laws
- Accuracy, fit of predictive model
- Internal people (skill, expertise)
- Budget availability
- Technologies/ tools/ infrastructure
- Business case content
- Interpretation, visualization, communication of results

- 13.1 How would you rate the IA department's understanding regarding the development of IT internal audit architecture?**
- Clear understanding
  - Average understanding
  - No understanding
- 13.2 Please rate the use of technology in internal audit within your company**
- Very progressive
  - Progressive
  - Average compared to similar companies
  - Conservative
  - Very conservative
- 13.3 How would you rate the system landscape within your company?**
- Very homogeneous (fully integrated solutions for all key internal audit- relevant business processes)
  - Largely homogeneous (fully integrated solutions and independent sub-systems for individual relevant business processes, connected to ERP system via interfaces)
  - Largely heterogeneous (different systems for significant parts of internal audit-relevant business processes, connected to ERP system via interfaces)
  - Very heterogeneous (different systems for significant parts of internal audit-relevant business processes, data were merged for relevant evaluations)
- 14.1 Do you expect major changes to the internal audit activities caused by new technologies? Please explain briefly**
- 14.2 Do you expect major changes to the internal controls and the internal framework caused by new technologies? Please explain briefly**
- 15. What would be your estimation on the future degree of automation of internal audit activities?**
- 10-25%
  - 26-40%
  - 41-50%
  - >50%

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