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The Effects of Digitalization on Auditing

A Study Investigating the Benefits and Challenges of Digitalization on the Audit Profession

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ABSTRACT (MAX. 200 WORDS):
Digitalization is an interesting and timely topic which is actively discussed nowadays. Big data & analytics, blockchain, artificial intelligence & robotic process automation are some of the most emerging technologies. This study aims to investigate the perceived benefits and challenges that these technologies bring, in the context of digitalization, to one of the most favourable professions for the specific process; the audit profession. This is examined through the scope of professional auditors. To achieve this, an extensive literature review initially took place. That contributed to identify what previous research on the specific topic has found. Thereupon, through the conduction of semi-structured interviews with seven auditors, six main benefits and two major challenges are identified. The identified benefits are: upskilling, improved audit quality, flexibility and efficiency, reputation growth, increased reliance and finally, the reduction of the expectation gap. New auditor profile and resistance to change are identified as the two factors posing challenges for digitalization in auditing. Conclusively, the empirical findings of this study agree with the notion that auditors think digitalization will be even more prevalent in the future and that digitalization will not lead to the loss of job opportunities, as claimed by previous studies.

Acknowledgements

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1 Introduction

1.1 Background

Gartner (2020) defines digitalization as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business." The first traces of digitalization were developed during the Industrial Revolution when new machines changed the process of commerce, capitalism, and, indeed, human history (Westerman, Bonnet and McAfee, 2014). As in present, innovation in digital tools is carrying the world and its inhabitants to "the second machine age" as Brynjolfsson and McAfee (2014) defined in their same-titled book. Zuboff (1988) uses the term digitalization to refer to the technological innovations that lead to opportunities, which subsequently creates a contemporary world for individuals. Regarding the superior level, digitalization includes the massive transformations occurring in society and industries with the help of digital technologies (Majchrzak et al., 2016). Critics have also argued that each organization has to individually discover means to renovate with these digital tools by implementing "strategies that embrace the implications of digital transformation and drive better operational performance" (Hess et al., 2016, p.123). Hence, concerning the audit profession, which executes operations to offer assertion that financial statements accurately match present accounting standards and precisely reveal the financial statement of a firm is also facing a technological transformation (Lombardi, Bloch, and Vasarhelyi, 2014). Accordingly, auditing companies and audit profession are possibly influenced by the additional development of information technology (Elliott, 2002), specifically in big data analytics (Alles, 2015; Constantinou & Kallinikos, 2015; Cukier & Mayer-Schoenberger, 2013; Richins, Stapleton, Stratopoulos, & Wong, 2017; Syed, Gillela, & Venugopal, 2013), artificial intelligence (AI) (Goertzel, 2007; Nowak, Lukowicz, & Horodecki, 2018), and blockchain technology (White, 2017). Chen et al. (2011) argue that growth in data analytics practices results in concerns and uncertainties regarding the efficiency of conventional audit operations within such an intensely progressed audit nature. Some of the grounds sustaining these operations appear to be not valid anymore to the present auditing field and significantly changing the skills or profile of auditing that was adopted for years (Vasarhelyi, 2013; Boritz et al., 2009). Evolving technologies have been widely adopted in the context of financial reporting, and this acceptance continues to grow every day, such that, artificial intelligence (AI), robotic process automation (RPA), and blockchain are shifting the business approach, and auditors are managing by altering their own operations (Julie et al., 2019). AI, blockchain, and big data & analytics are the turning points for the accounting field and the audit profession, as they change the responsibilities and functions of auditing professionals (ICAEW, 2017).

In the contemporary world, it is almost impossible to implement eased accounting operations without the help of computer and accounting technologies (Tarek et al., 2017). Therefore, accounting technology and software are getting extremely high-level. As a consequence of alterations in the auditing profession, the sophistication of accounting technologies is enhancing (Tarek et al., 2017). On the other hand, the growing complication of business and the

eruption of data, has brought out new challenges (Deloitte, 2018). According to Dobbs et al. (2015), compared to the period of the Industrial Revolution, the disruption of humankind society is occurring 10 times more rapidly and at 300 times the scale. Hence, the impact of digitalization is observed approximately 3000 times more in the new era. The auditing profession also receives its partial impact and challenges due to the rapid pace of digitalization and automatization of auditing tasks and operations that were formerly done manually (Sjöberg and Johansson, 2016). According to the Swedish branch-organisation for authorized public accountants (FAR, 2015), this continuous transformation could potentially reshape the whole auditing environment, which also means that the auditor profession could also face shifts with it. Elliot (1994) focused on possible opportunities and challenges within the auditing industry, especially mentioning that technological innovations offer an excess of digital sources ahead of the conventional financial accounts, therefore affects the audit quality. The audit quality is defined as the possibility for the auditor to detect inconsistencies in the financial statements and report them to the entities involved (De Angelo, 1981). Consequently, Lombardi et al. (2014) argue that this turns out to be even more problematic due to the past incidents of low productivity and disappointments with prior digital transformations. Those further fuelled the dispute of business process reengineering in Hammer's (1990) article, "Don't Automate, Obliterate" which calls for specific attention to be put whenever transformation is implemented by automation. Humphrey, Loft, and Woods (2009) declare that the business environment has progressed more promptly compared to the audit profession, hence audited accounting information is now in a noticeably inferior position in relation to other types of timely information (Lombardi et al., 2014). On account of these growing innovations in digitalization leads to the possible automation of cognitive tasks, the same way that machines substituted human tasks during the industrial revolution period (Brynjolfsson & McAfee, 2014). As these innovative progresses are able to pressure the whole auditing environment, they are very associated with auditors and their stakeholder parties (Tiberius and Hirth, 2019).

Even though its significance, as well as the reflection of digitalization and its influence for the auditing industry is limited, auditors have to get ready and be effectively trained to deal with the possible benefits and challenges. Those benefits and challenges are related to audit quality, skills, efficiency, and profile, and most of these impacts will likely demand the specific application and understanding of complex technologies (Lombardi et al., 2014). An alternative approach to this problem is to investigate the actual challenges and benefits that digitalization can bring to the current state of auditing (Tiberius and Hirth, 2019)

1.2 Problem area

The Fourth Industrial Revolution is upon us and with it arrives a wave of changes in both how business is conducted and how we live (McGinnis, 2018). Experts like the executive chairman of the World Economic Forum, Klaus Schwab (2016), claim that this revolution will affect society on a far greater level than the three previous ones. This is because, when compared to the previous industrial revolutions, the Fourth one is evolving at an exponential rate rather than a linear one (Schwab, 2016).

Big data & analytics, blockchain, AI, and RPA in combination with other advanced technologies enable the ability to capture and analyze previously thought unimaginable types and volumes of data (Deloitte, 2018). According to Lombardi, Block & Vasarhelyi (2014), one of the fields most affected by such advancements in technology is auditing. However, in a study

later published by the same three researchers, they claim that auditing has yet to fully rip the benefits of digitalization because simply there has not been enough incorporation of it (Lombardi, Block & Vasarhelyi, 2014). But digitalization, and mainly RPA, have already helped automate repetitive labor work. Consequently, this allows for more time and space to be given for data management by auditors. On the other hand, Khan from ICAEW (Institute of Chartered Accountants in England and Wales) states in her report that "Disruptive technologies are also having a profound impact on the skills required of auditors…" (Khan, 2018, p. 5). Alongside Lombardi et al. (2014) adding that auditors must become prepared and trained accordingly, in order to be in a position to handle the new challenges arising from the collection and processing of big data. This will undoubtedly require the know-how and understanding of advanced technologies. On the other side, Raphael (2017) suggests that auditors will not necessarily need to be computer programmers or experts in technology development. But nonetheless, they will need to have the practical experience and to be in a position to handle new tools in order to handle and analyze data (Raphael, 2017).

Aforementioned benefits alongside the threats posed by this transformation seem to be at the heart of the CPA (Certified Public Accountant) new project called Foresight reports Simon (2018). Foresight is a project that will study and provide a roadmap to navigate the evolving impact of new technologies, among other things, in a digital world that will impact areas of practice such as auditing, says CPA Canada president and CEO Joy Thomas (CPA Canada, 2020). On the same note, figures like the accounting professor of Harvard, Robert Kaplan, call for academic scholars to "…contribute to advancing the profession's body of knowledge, especially when innovation is high and major changes are occurring in the practice environment of the profession" (2011, p. 368). Thus, highlighting, even more, the currently ongoing transformation happening in the field due to digitalization. Ratzinger-Sakel & Gray (2015) in their study refer to an over thirty year old existing gap between the practice community and the academic community. They do consider this as an important obstacle that needs to be tackled in order for the audit profession to make a step towards a learned profession (Ratzinger-Sakel & Gray, 2015). Likewise, Alles (2015) challenges the audit field to embrace the opportunities that rise up from digitalization, mainly Big Data, and hopes that the audit field this time around will have learned its lesson from the past and hopes towards a positive proactive response instead of a defensive reaction to market pressure. More specifically, he states that "The lesson of history is the seeming slowness of the profession in adapting to previous technological changes, such as the computer and the Internet." (Alles, 2015, p. 447). Lombardi et al. seem to share the same thought explaining that "…the auditing profession, as any profession, cannot resist advances that may further the efficiency or effectiveness of the process, or it will find itself no longer viable." (2015, p. 15).

There exist two recently conducted studies around the topic of digitalization on auditing. The one conducted by Johansson & Sjöberg (2016) concluded that while digitalization played some role in auditing, especially for young auditors working in the Big Four accounting firms (Deloitte, EY, KPMG, and PwC) (Accountingverse, 2020) auditors expected digitalization to play a far greater role in the future. Moreover, the research conducted by Karlsen & Wallberg (2017) reports contrasting findings to past research claims. In particular, they explain that "The auditors expressed no concern of lost job opportunities, something that argues against what previous research claims." (Karlsen & Wallberg, 2017, p. 29). Reflecting on these points, it would be of interest to investigate both perspectives. Since, digitalization indeed plays a significant role now in auditing profile, job opportunities reduction, quality, and skills, it could be argued that a similar extension in the research area of digitalization and auditing would be of further interest. Finally, it is worth mentioning that when looking at the literature

regarding the impacts of digitalization, it seems to be a lack of specific IS research, signifying that the existing research about digitalization on auditing is very broad and inchoate. More specifically, the effects on auditing, particularly, perceived benefits and challenges of most prevalent technologies associated with digitalization such as big data & analytics, blockchain, AI, and RPA among others are not comprehensively examined.

1.3 Research question

The academic literature on digitalization within the auditing domain displays a lack of knowledge how auditors perceive the impacts of digitalization on their profession. In order to provide both academics and auditors with clear insights about the effects of digitalization on auditing profession, this research effort was appropriately set up intending to give the answer to the following research question:

What are the auditors' perceived effects of digitalization and related technologies on the audit profession?

1.4 Purpose

There has been a knowledge shortfall in how auditors perceive the effects of digitalization on their job, especially its affection on auditing profile, skills, and quality on an individual level. Therefore, the purpose of this study is to achieve a deeper insight and scrutinize the benefits and challenges of digitization-driven changes that auditors are perceiving within their profession. This thesis intends to contribute with up to date field data and research outcomes to the academic community of Information Systems in order to assist the research community to perceive and approach the various effects in a context that digitalization is resulting in the current transformation within the audit profession.

1.5 Delimitation

This thesis is descriptive in nature and is based on the opinions expressed by people who are working professionally in the field of auditing. The research sample is composed of seven auditors that reside and work in these three cities of Sweden: Lund, Malmö, and Stockholm. Interviews were the main data gathering method and were used in order to determine how auditors perceive the impact of digitalization on their work field. Referring to impact as any possible changes in the auditor's job characteristics due to his/her use of digitalization by-products and whether said impact met or satisfied their expectations. It should be clarified however, that measuring the impact that a new technology or method has upon a multidimensional system or field consisting of various components is a task easier said than done. Nevertheless, this research work is based on the approach of Weaver (2019, n.p.) about measuring impact, which denotes that: "Measuring something is always better than measuring nothing." By taking into consideration the above-mentioned perspectives, the two significant delimitations of our research are: The research has been conducted by two Information Systems master students with solid knowledge in Computer Science. Besides our greatest efforts to further

develop our knowledge in auditing, we are by no means professionals of the specific field. Hence, there might be questions we could have asked or questions we could have delved deeper into, had we been more familiar with the field. Finally, while the initial intended method of conducting interviews was in physical form, the pandemic's eruption, known as Covid-19 (WHO, 2020), imposed a change of plans. Thus, both the method of conducting the interviews and the methods used to approach potential interview participants had to be revised along with other, more trivial, things.

2 Theoretical background

2.1   What is auditing

Flint (1988) clearly denotes that the key duty of auditing is to determine if particular tasks are fulfilled efficiently, with rightness and under regulations and certain rules. The author further explains that auditing can be considered a certain type of inspection that includes securing accountability, implemented by a specific individual instead of the parties involved. More precisely, Cleartax (2019) adds that an auditor is a person who is required to examine the books of accounts of a firm, the validity, and correctness of the transactions operated. The auditor should also have a perception of the general outlook of the financial statements by examining the fairness and correctness of the statements of the company's financial position (Cleartax, 2019). Firms generate their financial statements based on a framework of generally accepted accounting principles (GAAP) according to their country legislation, also named as accounting standards or financial reporting standards (Adiloglu & Gungor, 2019). Porter (1997) has tried to explain to the early auditing professionals that before the twentieth century, one of the principles of auditors was fraud detection that it was the auditor's duty to inform shareholders of all misleading acts which impacted the correctness of the components of the financial statements. However, nowadays the auditing profession is in a change position from the conventional audit dependent on papers to a more digitized audit involving automated and paperless operations (Lombardi et al., 2014; Wagner, 2016). Hence, further details are discussed in the next sections.

2.2   What is digitalization?

As digitalization begins where digitization ends, it would be of benefit to begin examining what digitalization is by first mentioning what digitization is, as those two terms are closely related. Gartner describes digitization as "Digitization is the process of changing from analog to digital form…digitization takes an analog process and changes it to a digital form without any different-in-kind changes to the process itself" (2015, n.p.). Basically, digitization enables the conversion of something non-digital into a digital format that then can be accessed by computing systems. On the contrary, there is no "official" definition for digitalization. However, there exists one provided also from Gartner describing digitalization as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities" (2012, n.p.). In most cases, digitalization ensues digitization as it makes use of digitization's by-products with the purpose of supporting or enhancing current business methods and generating revenue while having digital information as the focal point. Furthermore, according to a report by Muro et al. (2017) digitalization has a profound effect on people and the world of work. Adding in the same report that "The acquisition of digital skills has now become a prerequisite for individual, industry, and regional success" (Muro et al., 2017, p. 38). There are many disruptive technologies associated with digitalization. Such technologies include but are not limited to: big data & analytics, blockchain, AI, and RPA (Harrington,

2018; McGhee & Grant, 2019). These technologies are the most prevalent in the digital transformation of businesses, hence they will be further examined in the following paragraphs as they play, or will play, a promising role in the digitalization of the audit field.

2.3 Digitalization technologies

Collin et al. (2015, p.29) describe the idea of digitalization, and its associated impacts, as a "global megatrend that is fundamentally changing existing value chains across industries and public sectors". Therefore, digitalization is inevitable for firms in many industries in the contemporary functioning world (Holley, 2004; Arsenie-Samoil, 2010). Arsenie-Samoil (2010) mentions that the audit profession and general accounting firms have to accept the effects of digitalization and must familiarize themselves with digital interventions and its unavoidable effects. Association of Certified Chartered Accountant (ACCA) and Certified Accountant of Australia and New Zealand (CA ANZ) (2019) claim that the current improvements in technology offer considerable capabilities to the audit profession, with a huge number of important forces indicating the need for digital transformation in auditing. The prevalence of IT leads to numerous auditing firms to adapt to the automation of accounting information systems (AIS) for obtaining competitive advantage (Tarek et al., 2017). Bierstaker et al. (2001) recommend that the auditors before initiating the arranging of their audit tasks and analyze the business process, they should grasp the technological interventions nature since an enterprise computing platform such as Systems, Applications and Products in Data Processing (SAP R/3) enable this analysis to be achieved effortlessly. Big data analytics, blockchain, and AI are the key drivers of evolution for both the finance and accounting field and the audit profession, changing the characteristics of both finance experts and auditors (ICAEW, 2017). Thus, the disruptive technologies such as big data, blockchain, AI and RPA at different phases of evolution is already having and will maintain to have, an unavoidable effect on the audit profession (ACCA and CA ANZ, 2019; Mansour, 2016; Adiloglu and Gungor 2019; Ramamoorti and Weidenmier, 2004; Forbes, 2018; Alao and Gbolagade, 2019; ICAEW, 2017). The following sections are described in more detail the digital capabilities namely big data & analytics, blockchain, AI, and finally RPA.

2.3.1 Big data and analytics

Big data is responsible for datasets whose volume exceeds the capability of average database software techniques to capture, store, manage, and analyze. (McKinsey, 2011). Meuldijk (2017) defines the necessity of big data for auditors as a significant tool to boost the risk assessment, scoping, trend analysis, and judgments. In line with present analytics research (Holsapple, Lee-Post, and Pakath 2014; Lee, Cho, Gim, Jeong, and Jung 2014; Delen and Demirkan 2013), Big Data has to offer auditors the possibility to operate prescriptive analytics such as implementing practices that computationally verify existing actions and their outcomes, regarding the certain difficulties, rules, and limitations (Lee et al. 2014). Since there is a current assessment through the auditing that has confronted various types of failing over the last years, for example, Enron and WorldCom to the financial crisis (ICAEW 2010; ACCA 2011), it is recommended that auditors should keenly involve Big Data as a strategy to enhance the success and integrity of their organizational products and services (Alles, 2015). Hence, auditors can possibly define Big Data as a tool to eliminate the expenses of their audits and improve profitability in the case of external auditors and cost-effectiveness for internal

auditors that are responsible for (Littley 2012). In addition, one of the most implicit usages of big data analytics by auditing professionals might be the improvement of visions regarding business transactions with external, non-accounting data, originated from big data that can be complemented with accounting data for credibility such as non-accounting information derived from social media can be used in transactions or asset valuations (Bierstaker et al., 2001; Yoon et al., 2015; Cao et al., 2015). Nevertheless, regarding the nature of Big Data, with its various sources of data that might be different or unusual for the auditors to use in the investigation, the patterns in the context of audit data sources are required to be revised and possibly re-investigated in consideration of Big Data. Despite the source, the data has to be trustworthy and valid. Appelbaum et al. (2017) present the issues that Big Data leads to the current audit profession and propose opportunities for research in Table 2.1.

Table 2.1: Issues regarding big data as audit evidence

Issues Regarding Big Data as Audit Evidence

Challenge of Big Data	Recommendation
How can the availability of Big Data sets be used to enhance analytics?	Research can suggest analytical techniques that take advantage of Big Data and evaluate how they improve audit effectiveness and/or efficiency.
Can the volume of data compensate for uncertain or lower quality of data?	Studies should be conducted that determine whether there exists an upper threshold of data volume, exceeding which could compensate for lower data quality. A framework for data value should be generated.
How can the amount of audit evidence provided by analytics in a Big Data context be measured?	Research should re-examine the concept of whether evidence derived from analytics is "soft," and a quantitative reliability scoring system developed for all types of audit evidence. This score could then be integrated in the overall risk assessment.
How can Big Data evidence be aggregated with other types of audit evidence in a methodologically sound way?	This research question can be integrated with that of the data measurement system.
How can quantitative measures be used to provide support for the auditor's judgment about the sufficiency of audit evidence?	This research question can be integrated with that of the data measurement system.
Alterability: How can the auditor be assured that the data have not been altered?	Research examining various tests for the assertion of accuracy in a Big Data context should be conducted.
Credibility: How can the auditor be assured of the controls surrounding the generation of Big Data external to the client?	Research examining/suggesting certain verifications of controls should be undertaken.
Completeness: How can the auditor verify that Big Data is complete?	Research should be undertaken that can provide suggestions as to the verification of Big Data for the assertion of completeness.
Approvals: Should Big Data provide evidence of approvals/ controls validations? Is this viable?	Studies of controls measurements of Big Data at all levels of generation and extraction should be conducted. For example process-mining techniques (Jans et al. 2014) can be used.
Ease of Use: Will Big Data require expertise to understand and extract and prepare for analysis?	What level of expertise should engagement staff attain to be competent in the modern audit engagement? This issue is addressed later in this paper.
Clarity: Can this Big Data be replicated/reperformed/recalculated by the auditor?	Research should examine whether this is a viable test in a Big Data context and, if so, how to perform it. This is the level of accuracy to be demanded from Big Data analytics. The concepts of materiality and relative error in the context of Big Data audit analytics should be examined in research.

2.3.2 Blockchain

Blockchain is a type of distributed ledger technology (DLT) that is still in an aborning stage but so far shows great promise to radically change how organizations conduct their business and thus, how they get audited (Schulman & Wilson, 2019). Blockchain could be described as a decentralized digital ledger that records transactions between two sides in a peer-to-peer (P2P) network and encrypts them (Narayanan et al. 2016; Jansen et al. 2019). According to Vaidyanathan DLT makes sure that "in a distributed ledger all participants are looking at a common view of the records" (2017, p. 5). The same author further claims that this is the opposite of the current typical situation where participants might be looking at different databases that are separately updated and edited (Vaidyanathan, 2017). Furthermore, a blockchain network can be separated into two categories: public and private. A public network is one that anyone can freely join as there is no central authority, this is also called permissionless network. A private one is when only permissioned users have reading and writing rights (Jansen et al. 2019), also called permissioned network. Users are encouraged to join the consensus mechanisms that protect the network with monetary gains, usually in forms of cryptocurrency. Some public networks for example are: Ethereum, Hyperledger, and the one that started it all; Bitcoin (Reiff, 2020). While both public and private networks are based on the same consensus mechanisms, private ones like Hyperledger are designed to be faster than the public ones (Vaidyanathan, 2017). Moreover, Hyperledger is focused on the development of an open-source DLT network that will facilitate business transactions (Hyperledger, 2018) which makes it of most interest for the audit field. As distributed ledgers could act as a universal bookkeeping service which makes it easy to track an audit trail since it eliminates the need to cross-check various documents through different databases (McGhee & Grant, 2019). In addition, a very critical feature of DLT is that its data are immutable, which ensures that past records cannot be deleted or modified except corrected with a balancing entry (McGhee & Grant, 2019). Finally, another noteworthy feature of blockchain is smart contracts. A smart contract is a blockchain code function that triggers specific action/actions when certain pre-established conditions are met, this could be really money and time saving for businesses where in the past they needed a third-party intermediary to transfer value or assets (Bible, Raphael, Taylor, & Oris, 2017). But just because something is executed automatically when some conditions are met does not mean that the intentions of the creators of such a contract had good intentions or that there might not exist any unwanted aftereffects (McGhee & Grant, 2019). Consequently, auditing smart contracts is a must.

2.3.3 Artificial intelligence

Undoubtedly, AI is one of the most promising and at the same time intimidating human inventions of recent years according to Microsoft founder, Bill Gates (Clifford, 2019). Artificial intelligence, and at times also referred to as machine intelligence, is considered as intelligence exhibited by machines compared to the inherited intelligence of humans and animals (Stanford, 2018). We can say that AI is an umbrella term for technologies that can be used either by themselves or in the combination of each other in order to mimic cognitive behaviors that are shared among humans, such as learning and problem solving (Issa, Sun & Vasarhelyi, 2016). Such technologies of relevance to auditing are: natural language processing (NLP), deep learning (DL) and machine learning (ML) (SAS, 2018). NLP refers to the capability of computers to understand human language both in text and speech. Usually, after NLP, machine learning is applied in order to extract useful information (Yordanov, 2018). NLP's biggest benefit in auditing is speed. NLP can look through hundreds of thousands of documents

at an uncontested speed compared to humans. On that note, Zhou claims that "At Deloitte, what once took four to five months to complete is now done in a week" (Zhou, 2017, n.p.). Like-wise, DL can be applied on social media and news articles to notify auditors of possible liability, market, and internal control threats (Sun & Vasarhelyi, 2018). ML can be split in two categories: unsupervised learning and supervised learning. As the name suggests, in unsupervised learning the algorithm only receives general instructions on what to do with data. While in supervised learning the algorithm receives specific instructions for the targeted result. Without getting into many details, some use cases for unsupervised learning in auditing are ratio analysis and classification of journal entries. Respectively for supervised learning two use cases are regression analysis and journal entry testing (Hoogduin, 2019).

Boillet (2018) from EY (Ernst & Young) summarizes these effects of AI on auditing:

- AI can be used to monitor financial transactions automatically.
- AI can boost the identification process of fraud by forming models focused on sophisticated ML.
- Artificial intelligence can interpret various sources of data such as emails, social media, and audio files from meetings for example.
- Artificial intelligence can also enable auditors to optimize their resources, allowing them to utilize their intuition in order to evaluate documents on a larger scale and in more depth.

2.3.4 Robotic process automation

According to the Institute of Electrical and Electronics Engineers (IEEE), robotic process automation (RPA) is "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, 2017, p.11). McGhee & Grant (2019) consider that RPA is mistakenly mixed up with AI and that these "robots" are nothing more than code programmed routines or scripts that resample advanced Excel macros rather than AI. The main difference between the two, Excel and RPA, is that RPA's "macros" can be applied and used in almost any available desktop or program (Moffitt, Rozario & Vasarhelyi, 2018). Aforesaid robots are simple to program and do not require a lot or any computer knowledge and can be easily used to automate manual, time-consuming, rules-based office tasks faster and cheaper than other automation technologies (PwC, 2017). Nonetheless, AI can be used to enhance RPA states Taulli (2020). Such an example is the "Discovery Bot" which through recording and analyzing the workers' keystrokes can identify processes to automate (Taulli, 2020).

According to PwC (2017), other tasks that could be automated by RPA in the audit are:

- Sending emails, requesting follow-ups when deadlines pass
- Monitoring development towards the annual audit plan or tracking key risk indicators (KRIs)
- Automating reporting and dashboarding activities, including populating audit committee and management report templates or internal audit's balanced scorecard

and finally,

- Automating the evaluation of data quality in systems like data files, verifying if all fields are filled in or to check for duplicate entries or not valid ones.

Such tasks would be considered tedious, dull, time-consuming, and if performed by humans, susceptible to mistakes (McGhee & Grant, 2019). RPA has several advantages: robots can work 24/7, are quicker, more robust, and can be easily scalable. However, as RPA can easily handle vast amounts of transactions it is of great importance that they are correctly set up and configured as an inaccurate set up may rapidly disrupt hundreds of thousands of transactions in such a short time Jansen et al. (2019) warn.

2.4 Perceived benefits

In the present world, the excessive usage of digitalized products or services is an indication that digitalization plays a big role in a wide variety of fields and industries (Ghasemi et al., 2011), causing it to be an unavoidable part of individuals' daily life in various ways. Because of the continuous transformation towards a digital society in which the consumption of IT is unceasingly growing, it is necessary to understand the way the audit profession is changed by digitalization (Breman & Felländer, 2014; Byrnes et al., 2015; FAR, 2015, 2016; Forbes Insights, 2015; Han et al., 2016). According to the study conducted by FAR (2016), they hypothesize that automation and digitalization of the auditing industry will result in structural modifications that will have a considerable impact on the entire audit profession. Hence, AC-CA et al (2019) also declare that the current improvements in technology assure profound advantages for the audit profession, with several essential forces indicating the necessity for technological adoption in the auditing. Such forces mean the growing enhancement in the size of data, transformations in business models, the changes towards automation, and the demand for a continuous and progressive attitude to auditing (CPA, 2018). Thus, by perceiving the major benefits of digitalization, auditors can comprehensively assess the importance of audit-related technologies to perform audit tasks effectively which will be discussed in the next sections.

2.4.1 Competence and upskilling

According to different studies, competence plays a key role in auditing and is a profound component that influences the effectiveness and value of the auditing profession (Nearon, 2005). In terms of this factor, most of the auditors agree that it is necessary to keep up with the current development in order to perform competently (Karlsen & Wallberg, 2017).

Ghasemi et al. (2011), Sutton (2000), and Nearon (2005) claim that the requirement upon the auditor to possess IT skills and abilities grows, which is a present-day of competence demanded. Moreover, respondents of the study conducted by Manita et al. (2020) also agree with the importance of technical skills derived from digital transformation that the auditors have to feel confident while using digital tools. They should be trained to gain specific technical skills to conceive the way users' data are designed and generated. Regarding the audit opinions, audit organizations have to provide proper technical support and training for the sufficient usage guidelines of newly adopted technologies (CICA 1994; Dowling, 2009; Thompson, Higgins, & Howell, 1991). Consequently, auditors can improve the competencies and skills to properly use auditing technologies for the purpose of extracting, analysis, and

interpreting data. Since disrupting technologies can change job responsibilities and skills required to operate current work tasks, formal organizational support has to be offered to workers impacted by such changes (Rintala & Suolanen, 2005). Formal support can be enabled by providing training and improvement programs related to the technical transformation and including alterations in the work circumstances in order to support the upskilling process of employees (Burke, 1995). Formal support through training programs is associated with planned and arranged learning activities used for improving particular skills and knowledge of performing specific tasks (Manuti et al., 2015). Therefore, modern-day auditors will benefit from a proper and scalable blend of professional competencies such as technical skills, abilities, and knowledge mixed with individual manners and behaviors of employees (ACCA, 2016). Littler and Innes (2003) also argue that the requirement for supporting training and knowledge-based programs contributes to the process of employee development and upskilling. In conclusion, auditors should follow the process of digitization, comprehend its effects, and possess the competence and skills needed to cope with it effectively.

2.4.2   Improved audit quality

Except above-mentioned, another significant benefit of digitalization is the advancement in the quality of the audit profession by offering auditors smarter analysis and continuous auditing. The quality of auditing can be enhanced by transforming audit companies to digital firms with the help of modern analytics and robotics tools (Manita et al., 2020). Subsequently, the author explains smart analysis by referring to the concept of automation of different repetitive audit tasks that increases the quality of the initial checks and significantly decreases the number of errors. Hence, the smart analysis of data provides superior insights into the clients' activities, its internal processes, the accounting schemes generated, and finally an improved awareness through the risks (Manita et al, 2020). Additionally, the author discusses cognitive technology and AI that will help the auditors in their decision-making by automatically fulfilling particular tasks and providing them with situations according to historical experiences. Eventually, these digital interventions enable the shift from a risk-based approach to an approach to analyzing all global data, which helps auditors to generate a smarter and more relevant result to their customers. For instance, Manita et al. (2020) explain that auditors do not anymore use the sampling approach for data analysis which may change based on the levels of expected risks, instead, they use global data for proper analysis.

Moreover, the paperless, electronically, on-line, and real-time approaches have led to continuous auditing. Rezaee et al (2002, p.150) define continuous auditing as "a comprehensive electronic audit process that enables auditors to provide some degree of assurance on continuous information simultaneously with, or shortly after, the disclosure of the information". Traditionally, because of the expenses of the collection of data that was an essential component to generate financial reports, efficient financial reports could only be generated periodically (Tumi, 2014). Therefore, reports could usually be published sometime after the occurrence of transactions they present. Tumi (2014) suggest that these limitations can be avoided by the assistance of the technological tools, allowing auditors to generate reliable financial reports on a real-time basis, or shortly after the incidence of transactions. Due to this improvement, Chan and Vasarhelyi (2011) reasoned the increase in efficiency and effectiveness of the audit-related tasks and reputation of the auditing profession. Karlsen and Wallberg (2017, p.28) also support the idea of CA by mentioning sustainability aspects of it, "Hopefully the audit profession will become more and more paperless which would have sustainable effects on the environment, a factor that has been highlighted as important by both auditors and previous re-

search". Thus, Tiberius and Hirth (2019) have a similar view that that annual auditing will completely be substituted by continuous or even real-time auditing.

2.4.3 Flexibility and efficiency

Finally, flexibility is considered to be one of the vigorous benefits that digitalization offers (Rezaee et al., 2001), that all of the auditors also go along with. The authors describe flexibility as a free choice of working regardless of place and the time that is probably one of the considerable advantages that most of the auditors highlight. Therefore, accessibility and flexibility aspects result in more comfortable and easier work conditions for auditors.

Additionally, some studies reveal that the digitalization in auditing contributes to more efficient audits (Ghasemi et al., 2011; Granlund, 2007). Hence, the majority of the auditors claim that efficiency is an obtained benefit when transforming from paper-based auditing to the digitalized auditing. To summarise, it appears that flexibility and efficiency is an advantageous aspect of digitalization upon the audit profession, which makes the auditor's job simpler.

2.5 Perceived challenges

As it practically happens with everything, someone has to first deal with the challenges before one can reap the benefits. This applies to the digitalization process in auditing as well. In other words, the auditors have to tackle the following challenges in order to realize the advantages that digitalization can bring to their field. There are two challenges which are perceived as the most crucial; a new auditor profile and resistance to change. A more analytical description of these challenges is provided below but in brief, auditors will need to adapt to the new requirements and skill sets needed to be an auditor. Mainly they will need to be more familiarized with technology and IT in general. Respectively, the second one is about resistance to introduced changes and is apparently related to the first challenge. Whenever something new enters the frame, whether it is for improvement or worsening of the current situation, people at first are hesitant to welcome and accept it into their reality. This could not only have adverse effects on the adoption of digitalization in auditing but may also lead in creating more problems than those supposed to be solved after its introduction. Below follows a more analytical description of the mentioned challenges.

2.5.1 New auditor profile

Possibly the biggest challenge that digitalization brings to the auditing field; is the call for a new auditor profile. A profile that moves away from the classic paper, pen, and excel to a more technologically savvy one. Raphael (2017) states that, even though auditors will not need to become technology development experts or computer programmers, they will still be required to possess technological skills, expertise and a strong sense of confidence to utilize cutting-edge, fast-moving technologies to process and evaluate data. Additionally, Raphael (2017) makes mention of some relevant technology skills:

- Extracting both structured as well as unstructured data from a broad range of sources.

- Engaging with relational and non-relational databases.
- Employing statistical techniques and sophisticated analytics software to transform raw data into valuable insights.
- Understanding how to use analytics to execute rigorous risk analyses and discover areas that require more auditing.
- Making use of visualization tools to show complicated data analysis in a way that is both convincing and simpler to understand
- Aside from the technical skills, McGhee & Grant (2019) identify additional quotients required by auditors in the future:
- Technical skills combined with ethics (TEQ): The skills and abilities to carry out operations continuously to a given level while also upholding the highest levels of honesty, independence, and skepticism.
- Intelligence (IQ): The ability to gain and utilize expertise, reasoning and problem-solving
- •Creative (CQ): The capacity to utilize current expertise in a different case, to create correlations, to discover future consequences, and to produce fresh ideas.
- Digital (DQ): Recognizing and using current and evolving new digital technologies, skills, practices, and techniques.
- Emotional (EQ): The capability to recognise the feelings of yours but also the ones surrounding you, control and use them on tasks and control, and maintain them.
- Vision (VQ): The potential to reliably forecast future developments by inferring current pat-terns and facts, and addressing knowledge gaps by creative thinking,

and finally,

- Experience (XQ): The skill and willingness to explore consumer needs, achieve desirable results, and generate value.

On the basis of all these, it is considered that the future auditor, or the current ones embracing digitalization, must possess a "hybrid" of skills that were not necessary for the past. This challenge is interrelated to a high degree with the following one.

2.5.2 Resistance to change

As previously explained in order to make use of the benefits brought by digitalization, auditors have to embrace a new auditing profile. However, this is easier said than done. Not only for auditors but in general. That is because humans are, by their very own nature, creatures of habit (Jabil, 2017). There are many suggested theories as to why humans are resistant to change, for example those stated from a professor at Harvard, Kanter (2012): loss of control, excess uncertainty, concerns about the competence, and more work just to name a few. But to make things worse for the auditing world, auditors are not one of those fields that jump head first in new technological changes, as it was already mentioned previously in the definition of the problem area. To be more accurate, Raphael points out that "The audit profession has a reputation for being steady" (2017, p. 32) which roughly translates into: no changes will be made if not deemed absolutely necessary or being forced to from the market/customers. According to Jansen et al. (2019) the willingness and appetite for change is a key challenge, especially in a field where people have the tendency to want to see things in a hardcopy even when automation is included. Another significant reason for auditors to not want to embrace digitalization is the fear of headcount reductions or the fear that their job tasks will be reduced

to being machine minders, according to McGhee & Grant (2019). Finally, Issa et al. (2016, p. 9) con-siders that it is "…. impractical for the profession to adopt any new technology or

methodology if not required or approved by the standard-setting boards. The researchers ex-plain further that the auditing field has to tackle the task of updating the existing auditing standards if it is for such disruptive technologies to prevail (Issa et al., 2016).

2.6 Conceptual framework

After scrutinization of all aforementioned notions and processes, a conceptual framework consisting of five key concepts has been created as the basis for this research work (see Figure 2.1). These concepts are respectively: auditor, auditing tasks, digitalization technologies, and finally perceived benefits and challenges.

Since the goal of this research is to achieve insights about the auditors' perspectives regarding digitalization, presenting an auditor as the main actor is essential in the framework. This actor has been the main target that we have contacted to acquire the information needed in order to answer the questions posed in this research work.

Moreover, auditors are required to accomplish various key auditing tasks that are respectively presented in the framework (see Chapter 2.1). Starting from collecting data from financial statements till generating audit reports based on the examination of financial statements of the organizations.

Furthermore, digital development is considered a crucial factor that affects auditors and their tasks. Therefore, digital technologies are the tools associated closely with the tasks of auditors (see Chapter 2.2; 2.3). The execution process of auditing tasks has been shifted by the in-volvement of digital technologies. For example, RPA is used to reduce manual reporting and automate some mundane tasks of auditors. Hence, the main focus of this study is the involve-ment of digitalization, specific digitalization technologies are applied to the framework that will help to assemble views on the usage of digitalization by auditors in the context of accom-plishing their key auditing tasks.

Finally, the auditing profile is affected by the involvement of these technologies in carrying-out of auditors' daily tasks. This affection can vary in level, based on how an auditor perceives these changes. Therefore, the last two concepts encompass the main perceived benefits and challenges of digitalization or the usage of digital technologies for auditors (see Chapter 2.4; 2.5).

A brief example of how some relations in the framework are interacting is provided in the following figure:

The auditor uses digital technologies as a tool. Tools are used to execute certain auditing tasks. If the auditor perceives that the utilization of these digital technologies contributes to, for instance, improved audit quality (being one of the perceived benefits), i.e. due to the use of Big Data, this would imply that that involvement of digitalization tools leads to the certain benefits for auditors.
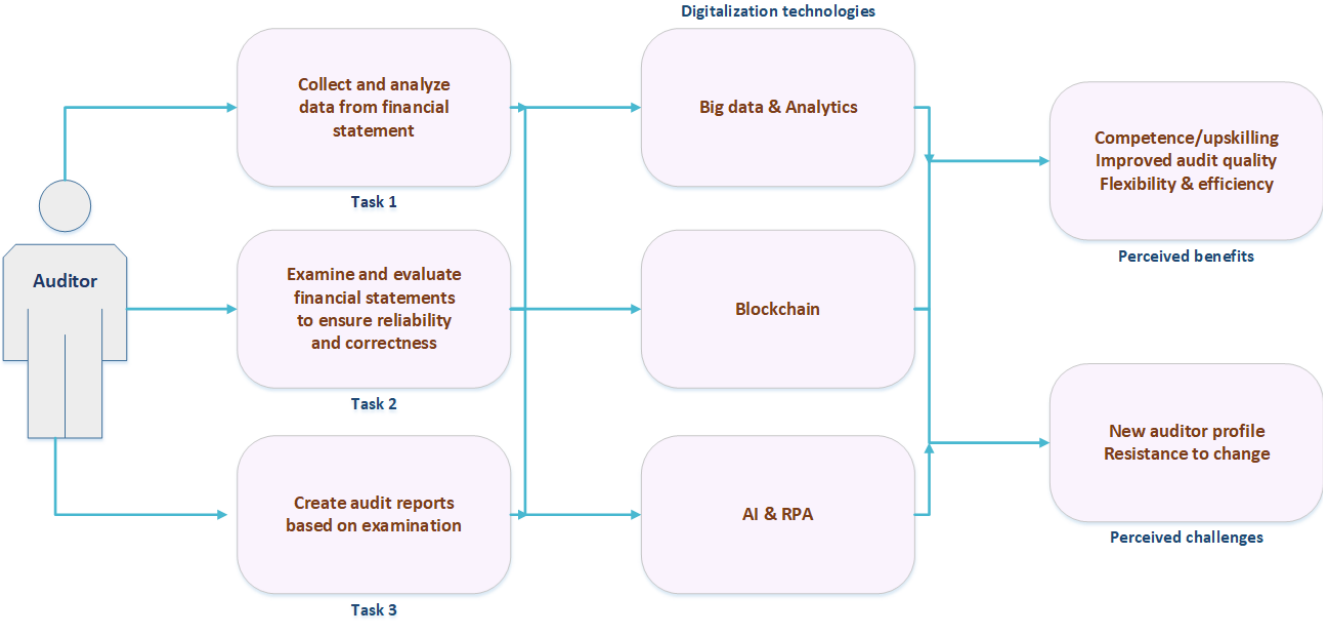
Figure 2.1: Conceptual framework

3 Methodology

3.1   Research strategy

Recker (2013) describes research methodology selection as a vital action in the process of research which can also be defined as the "strategy of inquiry" utilized to investigate a particular research problem. Since our research aims at a comprehensive examination of the effects of digitalization on auditors, it is important that the applied research strategy can significantly contribute to fulfilling these research objectives successfully. This thesis uses primarily qualitative research methods since these are recommended as adequate for non-numeric data processing in order to gather an in-depth understanding of social phenomena such as different perspectives, meanings, and concepts (Bhattacherjee, 2012). As the individuals' opinions or justifications behind their actions are highly attached with contextual meaning, qualitative research methods are the proper choice to discover this very context for providing logical clarifications for the reasons behind the development of phenomena (Recker, 2013). Qualitative research covers contextual meanings such as people's behaviors, opinions, and experiences (Mohajan, 2018). To theoretically ground this study, an academic literature review on the topic of digitalization and auditing has been in advance accomplished. From this review was found that literature is not fully covered in terms of this specific area and there exist insufficient theoretical frameworks to be applied in order to harmlessly base and plan our research effort. Consequently, the area of digitalization in auditing is still lacking and not yet fully-covered in terms of theoretical research and implementation, which comprises another reason to adopt a qualitative strategy for studying the phenomena that have not been comprehensively discovered (Recker, 2013). Therefore, Recker (2013) and Bhattacherjee (2012) suggest that the qualitative methods are the recommended strategy in terms of studying the reasonably unstudied topic such as the effects of digitalization in the auditing profession.

In addition, interpretivism is considered the most used paradigm for qualitative research, as it assists to insightfully perceive the human perspectives and behaviors in a particular context (Thanh & Thanh, 2015). This study is aiming at discovering the effects of digitalization through exploring auditors' or informants' perspectives which is the type of interpretivism. Therefore, the main goal of this research work is to conclude with the outcomes based on academic literature review in line with the conceptual framework and final findings of empirical data in an attempt to contribute to the IS research area.

3.2 Conducting the literature review

The initial step was the systematic exploration of existing literature in order to capture the research topic in-depth. We applied Bhattarcherjee's (2012) three-folded purposes of the literature review when we conducted our systematic literature review. These three purposes are described respectively:

1. Exploring the already existing knowledge within the study area
2. Determining main writers, actors and research papers within our study
3. Finding the lack of knowledge that can be improved by further investigation

Furthermore, since our study is focused on the interpretive approach, we attempted to investigate different kinds of interpretations such that both the contrary and alternative views of various authors (Randolph, 2009). The development of a systematic literature review was the most challenging and time-consuming. However, it was an unavoidable part of generating a relatable conceptual framework used as a guide for further empirical research. As we investigate consulting companies like Deloitte, EY, PwC, and KPMG which are highly specialized in producing reports and consulting other companies, we have used their published reports about various events such as the coming of the digital age. Thus, we have used the data available in order to refine the expectations we have coming from our very own interviews and as well as use that data to better understand our very own produced data as well.

In addition, we acquired information and data from other previous similar research papers and articles and we did not limit ourselves just to reports from said companies. The key sources for finding relevant academic papers and articles were Google Scholar and LUBSearch, Lund University online library. For finding relevant academic studies and reports, we used the following search terms on the above-mentioned academic search engines:

- Digitalization and Auditing
- Digital Technologies in Auditing
- Big Data and Auditing
- Artificial Intelligence (AI) and Auditing
- Blockchain and Auditing
- Robotic Process Automation (RPA) and Auditing
- Impacts of Digitalization on Auditors
- Benefits of Digitalization in Auditing
- Challenges of Digitalization in Auditing

The assortment of relevant literature consisted of three key steps: Initially, the articles were filtered based on their relevance to our research area. Most of the articles were related to the adoption of digitalization. Since this work is focusing on the effects instead of adoption, those irrelevant papers are filtered later. The next step was to read the abstracts of the articles and papers with unrelated abstracts to the aim of our study which were also removed. Finally, the remaining papers were completely read and analyzed by both authors in an attempt to achieve different viewpoints including insightful and contrary. Moreover, the analysis of the articles has included finding gaps in the studies such as checking the connection between theoretical background or frameworks and its final findings and how these two parts are synchronized with each other. These paces of the literature review were specified in-depth and well-documented to confirm the transparency of our study.

3.3 The interview and data collection process

3.3.1 Responders selection

One of the first steps of the empirical study was the task of selecting the right responders and scheduling an interview with them. In responders selection, we used a purposive sampling strategy in which we purposively selected the applicants with the profiles that are suitable to the objectives of our study. It is considered a non-probability strategy that does not rely on a certain number of responders and specific theories (Etikan, Musa & Alkassim, 2016). More specifically, we started by identifying from which companies we could extract the most insightful and meaningful information. Thus, we decided to choose the Big Four. "Big Four" is used to name the four biggest professional services firms (Accountingverse, 2020); Deloitte, Ernst & Young, KPMG, and PwC. We decided to focus on these companies as they are the key leaders of the auditing field (Whittaker, 2019) and have invested billions into technologies and digitalization (Kapoor, 2020). Making them prime candidates and most suited to get valuable intel from. Having settled on which organizations to focus on, we began the process of getting into contact with them and trying to find auditors or managers of auditing departments that were able and willing to participate in an interview. So, we began by emailing those four firms, asking if there were people willing to participate in our study. The responses from that approach were zero. At the same time, we went ahead and started messaging and emailing people we knew that are relevant to the field and that could possibly get us in contact with suitable interview candidates. As a suitable candidate we name someone working either as an auditor or that is directly correlated to auditing (e.g. head of the auditing department) and that is familiar with digitalization in auditing and thus, can provide useful information on the topic. From the previously mentioned approach we managed to ensure the participation of three auditing professionals. However, this number of participants is relatively low to manage to get useful findings from, we decided to go "hunting" and hence, we started visiting the Big Four representing offices in Lund and we also started attending events organized by these firms in our university. Those two approaching modes, undoubtedly, had the biggest success rate and led to ensuring most of our interviewees; four in number. Yet, we wanted to ensure the participation of a larger number of candidate interviewees just in case some of them got canceled or in case we did not get good enough info out of them. So, we also visited the representing offices of the Big Four in Malmö. But that was shortly after Covid-19 cases emerged (Folkhälsomyndigheten, 2020) and started piling up globally which as a result meant that already most of the auditors were not present in their offices and were working remotely. From this final step, we confirmed one more interview. Overall, we booked eight interviews but in the end one participant withdrew from participating due to health issues, which left us with conducting seven interviews in total.

It should be noted at this point that at first, our intention was to conduct physical interviews and therefore, focus on responders based on Lund or Malmö. However, due to the Covid-19 outbreak being a pandemic (WHO, 2020) we had to revise our plans of conducting physical interviews and switch to remote ones. On the bright side of things however, that had as a consequence that there were no longer any physical constraints in choosing participants and we could go ahead and interview candidates not only from Lund but also from Malmö and Stockholm.

The table below provides an overview of the interview participants (see Table 3.1). The position field is filled based upon the answer the responders gave when asked what their current work position and responsibilities within the organization were.

Table 3.1: Overview of the different types of participants

ID	Position	Company	Date	Method
P1	Audit manager	EY	April 1st 2020	Zoom
P2	Auditor/Head of development	KPMG	April 3rd 2020	Skype for business
P3	Audit assistant	Deloitte	April 8th 2020	Skype for business
P4	Qualified auditor	KPMG	April 9th 2020	Skype for business
P5	Auditor	PwC	April 14th 2020	Google Hangouts
P6	Senior auditor	PwC	April 17th 2020	Google Hangouts
P7	Risk and advisory consultant	PwC	April 22nd 2020	Google Hangouts

3.3.2 Data collection

There are a plethora of different methods for collecting data while doing a qualitative study, with interviews being the most common type and from this category; face-to-face ones are the most prevalent (Bhattacherjee, 2012; Recker, 2013). Interviews have the great benefit of allowing to focus exactly on the "heart" of the topic being examined while also allowing to learn the viewpoint of the interviewees (Recker, 2013). In addition, interviews are adequate in providing meaningful context-based information derived from the feelings and thoughts of the responders (Oates, 2006). However, there are also dangers that need to be taken into account and to be avoided when using interviews. For some, interviews could possibly be affected by the interviewer effect (West & Blom, 2017). More specifically, the interviewer effect describes a situation where the interviewee will be prone to alternating his/her behavior due to the presence of the interviewer (Recker, 2013). Recker (2013), further explains that the inter-

viewee may feel encouraged/pressured to give responses that he/she thinks will please the interviewer.

Interviews besides the different techniques that can be used such as face-to-face, one-to-many, or remotely can also be different in nature. Namely, they can be descriptive, exploratory, or explanatory (Bhattacherjee, 2012; Recker, 2013). Exploratory research is suited as the initial research into a theoretical or hypothetical idea, descriptive research is defined as the attempt to explore and explain while also providing further info about a subject and explanatory research is used in order to investigate a previously not so investigated problem (Bhattacherjee, 2012). Moreover, interviews can also be classified in the following different types: unstructured, semi-structured, and structured interviews (Myers & Newman, 2007). In unstructured interviews there does not exist any predefined script to follow, there are only some base themes/subjects and the interviewers improvise and adjust during the interview (Myers & Newman, 2007). On the contrary in structured interviews, there is a pre-established script that should be strictly followed and does not allow for improvisation (Myers & Newman, 2007). Semi-structured interviews, as the name suggests, are the middle ground between those two as there is a script that is followed but there is also room for improvisation which allows acquiring insights that perhaps were not anticipated by the interviewers beforehand (Myers & Newman, 2007).

For our study, we conducted descriptive research with semi-structured interviews as we had predefined questions but we also asked some additional questions, on the spot, based on the interviewee's answers. In an effort to eliminate the interviewer effect, we shared our established questionnaire with the participants a few days before the actual interviews took place, in hopes of making them feel more comfortable with the whole process and not feel surprised or unprepared. Finally, we explained to our participants the purpose of the study multiple times throughout the whole process; the first time was when we initially approached them, then in the following emails, and finally at the start of the interview. Thus, being fully aware of our study's aim and providing relevant and insightful answers. From a technical aspect, when conducting the interviews we made use of a plethora of telecommunication applications solely based on our participants' preference. Saving them the trouble of registering and downloading software they were not familiar with. Thus, ensuring the maximum feeling of comfort for them. In numbers, three interviews were conducted in Skype for Business, three in Google Hangouts, and one in Zoom. When applicable, we requested the participants to also record the interview by using the prebuild recording tool of some of those applications and then send it to us in order to also have their version of the interview. We did this because in theory their version should not include any clippings, or gaps due to bad connection when giving their answers. Finally, when the telecommunication tool used did not have a built-in recording option, we made use of free and open-source recording software called "Open Broadcaster Software" (OBS).

3.3.3 Interview guide

As mentioned above, we created predefined questions of semi-structured nature which is very frequently used in qualitative research in Information Systems according to Myers & Newman (2007). Thus, for our interviews we made use of the predefined questions in order to ensure to get insights for the study's main questions investigated (Booth, Colomb & Williams, 2008) while leaving room for some improvisation in the spot to acquire even more insights. Booth et al. (2008) also state the importance of having a script since it enables the interview-

ers to be prepared for the interview and minimizes the danger of being unready and having to rely too much on thinking suitable questions on the spot.

The interview guide was generated with relevance to the defined conceptual framework and the questions were organized in accordance with the framework's main themes. The consistency between the conceptual framework and interview assures that interview questions and their responses aim to focus on the research problem, therefore achieving the preliminary aim of answering research questions. In line with Ritchie and Lewis (2003), we attempted to obtain both depth and breadth in the interview question by categorizing questions by themes and creating different kinds of questions around each theme. When designing the questions and the overall theme of them, we drew inspiration from Myers & Newman's four steps (2007) while also having our research questions and the subject of our study in mind. Our questions were separated into six main themes:

1. Opening – There are three purposes in this theme: to get the interviewee to feel comfortable, to ask for permission to record the interview, and to inform the interview participant about the most important details of the study.
2. Introduction questions – The purpose of this theme is to get some general information about the interviewee and start getting him/her to "talk" before we move on to the more important questions. A short warming-up discussion before the start of the main interview questions.
3. The theme is split in the technologies we investigate (BD & analytics, block-chains, and AI & RPA) – In this theme, we refer to the digitalization technologies theme of our conceptual framework while investigating the effects (good and bad) of these technologies in auditing as the interviewees perceive them and how often those come of usage in their work routine. We have also chosen to inquire about AI and RPA together. We took this decision as we think that these two technologies, while different, are more often than not used together in order to achieve better results. But it was also a decision made in order to reduce the duration of the interviews which should lead to more attentive interview participants and thus, more insightful answers from their part.
4. Digitalization views (perceived benefits and challenges) – As the name suggests, this theme has direct questions about investigating these technologies in a more general manner to understand how the interviewees perceive digitalization such as its benefits and challenges in their profession in line with our main framework themes of perceived benefits and challenges.
5. Closing – With this theme the interview wraps up and we give the chance to the interviewee to pose us as with questions or to mention anything else related to the interview or the study.

It should be noted that we did not include the opening questions when we interviewed the participants of the interviews. In the following table (table 3.2) the full version of the interview script is presented.

Table 3.2: Full interview script

Theme	Theme questions
Opening	• Introducing ourselves to the interviewee. Enquiring of current emotional state, opening for following questions. • Asking for permission to record the interview, explaining that it would make the transcription process a lot easier on us. • Briefly explaining the purpose of the study. Serves mostly as a reminder, since the interviewee has already been informed in the past and aims for better and more relevant answers. • Assuring the interviewee that there are no right or wrong answers. And that we are only after honest opinions/views. Hence, why participation in our research is anonymous. • Making known the capability to revise the transcript or to modify provided answers at any point. • Inquiring the interviewee if they pose any questions before proceeding with the main parts of the interview.
Introduction	• What is your working and educational background? • What is your current work position and responsibilities within the organization? • How would you describe your relationship with computers and technology? • What do you know about digitalization? How would you define it? o Could you name some technologies associated with digitalization both in your field and outside of it?

Big data
 	
&
 	
Analytics
	• Are big data and analytics incorporated in your auditing department?
	   o If yes, how are they of use?
	   o If not, why not?
	• Are big data and analytics something you make use of in your work routine?
	   o If yes:
	      ▪ How often are they of relevance in your weekly work routine?
	      ▪ In what aspects do they help you do your job?
	      ▪ Have they affected your job in any negative way? If so, please elaborate.
	• If not:
	   o Why not?
	   o Can you mention some ways that you think they could help you do your job?
	• Can you mention a scenario where their implementation would negatively affect your job? Are big data and analytics incorporated in your auditing department?
	   o If yes, how are they of use?
	   o If not, why not?

Blockchains	• Are blockchains incorporated in your auditing department?
	   o If yes, how are they of use?
	   o If not, why not?
	• Are blockchains something you make use of in your work routine?
	   o If yes:
	      ▪ How often are they of relevance in your weekly work routine?
	      ▪ In what aspects do they help you do your job?

	▪ Have they affected your job in any negative way? If so, please elaborate.
	• If not:
	    o Why not?
	    o Can you mention some ways that you think they could help you do your job?
	    o Can you mention a scenario where their implementation would negatively affect your job?

AI
 	
&
 	
RPA
	• Are Artificial intelligence & RPA incorporated in your auditing department?
	    o If yes, how are they of use?
	    o If not, why not?
	• Are AI & RPA something you make use of in your work routine?
	    o If yes:
	        ▪ How often are they of relevance in your weekly work routine?
	        ▪ In what aspects do they help you do your job?
	        ▪ Have they affected your job in any negative way? If so, please elaborate.
	• If not:
	    o Why not?
	    o Can you mention some ways that you think they could help you do your job?
	    o Can you mention a scenario where their implementation would negatively affect your job?

Digitalization views	• How familiar and confident do you feel using these technologies?
	• Did you receive any prior training on how to use them from your former education or your workplace? If yes, in what ways?
	• Did you try to further familiarize yourself with them by yourself? If yes, how?
	• How would you react if you were informed you will have to start using them more?
	• What are your feelings towards digitalization of the auditing profession?
	• Are there any specific parts of the profession that you think is most affected by digitalization?
	• Do you think digitalization has added quality in the auditing process?
	    o If yes: In what ways or in which cases?
	    o If not: Why?
	• Do you think digitalization has reduced the number of repetitive/mundane tasks?
	    o If yes: In what ways or in which cases?
	    o If not: Why?
	• How do you envision digitalization's future impact on your field? What changes will it bring?
	    o And is it going to be more prevalent than it is now?
	• What do you think is or will be the impact of digitalization on the number of auditors required to be employed?
	• How satisfied are you personally by digitalization's impact on auditing? And why?
	• What are the benefits, opportunities and risks that you think digitalization brings on auditing?

	• Is it harder or easier to be an auditor now than in the past? And Why?
	  o Do you think that the skills/requirements to be an auditor are going to change in the future?
	  o What changes do you expect to see?

Closing	• Is there anything we have not brought up and that you would like to mention? • Would it be alright with you if we contacted you in case new information or a clarification is needed? • Would you like receive a copy of the study once it has been published? • Is there anything you would like to ask us?

3.4 Data analysis

Transcription of the interviews was conducted to ensure that quotes and opinions of the interviewees transparently delivered for the analysis stage of the research. Kvale (1996) explains transcription as the modification from one form (audio) to another form (text). In line with this, we transcribed each interview from audio or oral form to the texts and it is represented as transcripts that can be found in Appendixes 1-7. Furthermore, we used an online video-sharing platform YouTube by uploading interviews privately with only us (researchers) having access to the files to ensure anonymity. As YouTube enabled us to download transcripts of the interviews, we additionally made some manual re-corrections to the text in order to assure the correctness of the transcription while matching it to the actual records.

Actually, we are in agreement with Recker (2013) that data collection and analysis are highly associated with each other. Since it is impossible to result in high quality of empirical findings without analysis of collected data, this means collected data with rich content can contribute to the effective analysis and consequently findings. Therefore, according to Miles and Huberman (1984), it is essential to comprehend and analyze the collected raw data for achieving our research aim. In line with Bryman and Bell (2015), the analysis of qualitative data is not as simple as the analysis of quantitative data, as it is based on the classification of the textual data instead of computable data. While there are no straightforward rules of qualitative analysis, there exist certain approaches to qualitative analysis; for example, analytic induction, grounded theory, and coding (Bryman and Bell, 2015). In line with this, we chose analytic induction (Patton, 2014) to develop an analysis that includes both deductive and inductive analysis. We initially used deductive analysis which codes were developed in advance (Gibbs, 2007). There-fore, our main themes or codes were developed in accordance with the conceptual framework that was also used as a guide of key concepts to investigate for the interviews. Thus, we had 3 main themes that are aligned with the main concepts of our conceptual framework: digitalization technologies; digitalization benefits, and digitalization challenges. Furthermore, we enhanced our main codes with sub-categories in which we used empirical data by generating sub-categories that used to present more insightful conclusions. For the development of our sub-codes we also used inductive analysis where we expanded sub-codes of conceptual frame-work with new sub-codes driven from our empirical data beside (see "Sub-Codes" in Table 3.3). Perceived Benefits was the only theme that expanded with the additional sub-codes (auditing reputation growth, increased reliance, reduced expectation gap) besides the sub-codes of the conceptual framework (competence and upskilling, improved audit quality, flexibility, and efficiency). Sub-codes are generated manually by referring to the

data-reduction as the meth-od of selecting, simplifying and transforming raw data into classi-fied data with the aim of providing sense-making meanings (Miles and Huberman, 1984). Thus, reduced data was used to explain the meanings of the codes or themes as the authors suggested.

Table 3.3: Coding Scheme

Codes	Description of the Codes	Sub-Codes	Description of the Sub-Codes
DT	Digitalization Technologies	DT-BDA DT-AI DT-RPA DT-BCH	Big Data & Analytics Artificial Intelligence Robotic Process Automation Blockchain
PB	Perceived Benefits	PB-CU PB-IAQ PB-FE PB-ARG PB-IR PB-REG	Competence and Upskilling Improved Audit Quality Flexibility and Efficiency Auditing Reputation Growth Increased Reliance Reduced Expectation Gap
PC	Perceived Challenges	PC-NAP PC-RC	New Auditor Profile Resistance to Change

3.5 Scientific quality & ethics

3.5.1 Research quality

Maintaining high quality for qualitative research is not an easy task due to the contextualiza-tion and interpretative nature of it. One way to express quality in research is by maintaining high credibility, validity, and consistency levels throughout the whole process. In order to achieve this, we followed up on the seven "principles for interpretative field research" as ex-plained below in table 3.4 by Klein & Myers (1999):

Table 3.4: The seven principles for interpretive field study

The seven principles for interpretive field research
1. The fundamental principle of the hermeneutic circle
The first principle suggests that as researchers we should consistently iterate between looking at the big picture, the purpose of the study, to more specific parts (Klein & Myers, 1999). This enables for greater understanding between the participants of the research and the conductors of the research. We followed this principle throughout the whole process.

2. The principle of contextualization

The second principle asks the researchers to know what events have led up to the current topic of study (Klein & Myers, 1999). We achieved this, by conducting a literature review.

3. The principle of interaction between the researchers and the subjects

The third principle states that the participants of the research are not mere data waiting to be gathered like "rocks" but are actually interpreters. So, researchers should be careful with their treatment because it can directly affect the data and thus, the results of the research (Klein & Myers, 1999). We achieved this in a couple of ways: Firstly, we only interviewed volunteers and were also fully aware that they could withdraw from the study at any given point if they did not feel comfortable. Secondly, we informed the interviewees that their participation will remain anonymous from the start to the end of the research. Thirdly, we tried to reduce discomfort for our participants by conducting remote interviews, thus they were able to choose a place of their liking to conduct the interview whether that was their home or their office. Finally, our participants were fully aware of the topic and intentions of the research they agreed to take part in.

4. The principle of abstraction and generalization

The fourth principle suggests that the findings of the research should be compared to other similar researchers' findings up to the degree that is possible. We fulfill the requirements of this principle as well by comparing our findings to other research results retrieved from the literature review performed.

5. The principle of dialogical reasoning

The fifth principle asks the researchers to compare the initial thoughts or biases they had before conducting the research to their actual findings and try to spot contradictions through constant revision (Klein & Myers, 1999). Likewise, with the very first principle, we followed this principle throughout the whole research process. More specifically, after the competition of each interview a discussion between the researchers about the answers that were surprising was done.

6. The principle of multiple interpretations

The sixth principle, calls for sensitivity to the possible differences in interpretations between the participants as the different people view the same event from different lenses (Klein & Myers, 1999). We kept this in mind during the interviews and after. Especially considering that we did not only interview auditors of different ages and work experiences, but also due to the fact that we interviewed people with more responsibilities among their audit department than those being simple auditors.

7. The principle of suspicion

The seventh and final principle suggests that researchers should be very cautious for biases in the answers of the participants (Klein & Myers, 1999). As researchers we tried our very best to be fully aware when receiving and coding the answers provided by the participants and tried to filter out any "distortions" in their narratives.

By comprehensively applying the seven principles for the interpretive field study of Klein & Myers (1999), the quality of our research work is validated. Still, another factor that affects the quality of a study is reliability. As pointed out by Bhattacherjee (2012), reliability ensues when conducting the same research again results in similar if not the same results. To achieve this, both the researchers have to produce their own findings from the transcriptions and then to compare them in order to spot any differences which then have to be discussed and resolved once they are recognized.

3.5.2 Research ethics

Bhattacherjee (2012) argues that the idea of ethics is used to differentiate two different concepts of right and wrong. On the other hand, this moral differentiation is not a straightforward action for humans. Therefore, conducting interviews also requires the consideration of ethical values for researchers who take responsibility for revealing participants' information or opinions (Recker, 2013). Thus, our research conforms with ethics by keeping the participants' names anonymous for concealing their real identities. All participants of this research were informed beforehand of the goals and methods of the research thus ensuring full transparency. They were given a consent paper to sign that provided them all the important details of the research, which has been pseudonymized and kept safe under the General Data Protection Regulation (GDPR). Furthermore, the conductors and handlers of the data extracted made sure that they are safely kept and anonymized so the participants cannot be identified by other entities, as GDPR requires. However, the company names and job titles of the participants that we worked with for collecting empirical data were mentioned for making our research target clear and straightforward. As Bhattacherjee (2012) and Recker (2013) recommended, the consent for the recording of the interviews was also asked to ensure participants' confirmation for revealing their personal opinions and experiences in our research.

Before the actual execution of the interviews, we contacted the potential participants to provide information and the aims of our research. This was accomplished by emailing, consequently, offering them the option to repeal their involvement based on this information. This

information included the thesis title, interview duration, and location as suggested by Oates (2006).

Due to the Covid-19 outbreak, we had to ask participants for the shift from in-person to online interviews. We also sent the last versions of transcriptions to the participants in order to ensure that no changes or modifications have been added that can shift the actual context or answers of the interviewees. Besides conforming with their trust in the authenticity and actuality of the transcriptions, we allowed the participants to have an opportunity for making any further changes to the transcription as they needed. To conclude, an effort was made to not ask questions that the answer to them could be used to trace back the interviewees, to the degree that was possible.

4 Findings

4.1 Digitalization technologies

In all our interviews, the discussion has been started by talking about digitalization and the prevalent technologies associated with it from the perspective of each auditor. When discussing the definition of digitalization for auditors, most of the auditors agreed that it is the trendy term when organizations move the processes from paper or manual basis to the digitalized form. P7 also defined digitalization while also explaining the difference between two common terms of digitizing and digitalization:

> *...when processes go more digital and because certain activities get digitized and they are performed digitally instead of physically and when it comes to digitalization it's more a whole process that goes digital. The phrase digital journey and digital transformation are becoming such and such. There are common phrases like digitizing which businesses use when a single process or operation becomes digital. However, our businesses are not only digitizing now, but they are also digitalizing right that they're moving whole processes to be digital instead of just using you know word instead of paper* (P7: 10)

On the other hand, P2 describes it more like a change the way the auditors worked before (P2: 26). It is the new technique in the cloud that comes with properties of optimization, standardization, or all in innovation and changes the performance of operations (P2: 26).

After finding out their initial definitions for digitalization, participants were asked to name some technologies associated with digitalization either in their field or outside of it. P1 mentions the tools come with Microsoft such as Microsoft Teams to manage their auditing teams (P1: 22). In line with this example, P2 also considered Microsoft programs such as Azure and DevOps as sophisticated project tools that audit companies make use of (P2: 28). Furthermore, P5 mentioned general terms like AI and RPA are very useful and dominant nowadays. AI-enabled technologies and AI is one of the techniques of accomplishing digitalization (P7: 12). P7 also touched upon the Big Data that it's more product of digitalization than it is a digitalization technique, "...we have the extract, transfer, and load or ETL and processes that work with Big Data " (P7: 12). One of the interviewed auditors also reveals that they have developed their digital audit tools internally besides using famous tools like Salesforce or Workday that are the main tools used by companies (P6: 16). "We can tell many payroll management programs that they don't really need to sign a paper but everything is done digitally" (P6: 16). Acknowledging the importance of the Internet, P3 states that everything is online and cloud nowadays such as uploading, sharing, and archiving files in a specific system that auditors work (P3: 16). Lastly, two of the respondents mention that the clients are the drivers for implementing and using innovative technologies for auditing of these particular clients:

Because we can be good at this but also our clients need to change because if they are still using paper or not new techniques. Then the things that I am putting into the market will use less or worse if it's a paper-based audit and so on. So, we also have a way to work with our clients to digitalize them also. (P2: 108)

I don't think that a lot of different businesses right now are fully committed to the block-chain. We're not using it right now because the clients are not there. We have to understand what the blockchain and what it is to be a better auditor with it. Blockchain is basically a general ledger and they would need to use this as a general ledger for us to be able to audit it. If they're not using it, what we can do is maybe if we could try to build the general ledger to encourage it. But I don't think that's our role in the market. There are tech companies that do that better. I think we are with more advising around the blockchain how to use it than to actually build it. (P7: 24)

4.1.1   Big data and analytics

After investigating general thoughts about digitalization, respondents are asked about the usage of Big Data and Analytics in their audit departments. Six of the respondents approve the direct usage of it to execute their audit tasks (P1: 24; P2: 32; P3: 20; P4: 18; P5: 28; P6: 18). P6 mentions that they have journal entry analytics where they use software to perform analytics over journal entries that are extracted from big data of clients (P6: 22).

I mean now it's an essential cornerstone in our audit, we wouldn't be able to perform an audit of that quality but also efficiency without the big data tools that we are using. So we use a range of different data tools all from looking at income statements to balance sheets to planning, and also in preparing communications with the clients. So yeah I mean definitely a big part and I wouldn't be able to do my work without the analytics tools (P1: 24)

P3 and P4 further support this, by highlighting risk analysis to discover relevant issues or outliers (P3: 20; P4: 24). P5 provides another aspect that benchmarking is also enabled by analyzing big historical data between the years for one company or against other companies in the same brunch or the same sizes or the same region (P5: 34). One of the interviewed auditing companies has developed their internal software where they put big data from the client and receive specific formatted reports that they can analyze further (P6: 24). On the other hand, P7 reveals the auditors focus on summarized financial data that has already moved from big data state to ERP systems. However, the respondent claims that they perform data analytics similar to big data that before starting analytics they clean the summarized financial data.

For example, the inventory analysis for some company's inventory and it can be very important for them to understand these figures are correct or can we trust it and that's when we do the inventory analysis. We basically go through the inventory value list, we look at all the inventory transactions for each article and we look at purchase orders and customer orders to see ok what we can trust. So we kind of recreate the real flow with the data that we get from the systems to check if it matches the reality. Can we trust the numbers? So, when comparing it to big data analytics, the cleaning process is similar but it's not the same be-

> *cause we do not have the same complex data sets or raw data. When it comes to*
> *analyzing it, it is summarized and compromised form, I think it's quite similar*
> (P7: 18)

Moreover, P3 mentions one of the benefits of big data analytics that it helps to focus on what is relevant by using specific sampling instead of random (P3: 22). For instance, with the help of PowerBI, auditors can focus on specifically different areas like regions and late payments and if there are late payments, then they can go back and take samples from that specific one instead of choosing random samples (P3: 22). Lastly, most of the respondents did not receive any direct negative effect of big data and analytics on their job. In line with this, P1 does not consider it a negative aspect but he/she claims that "...receiving all this data from the companies it's like finding a needle in a haystack" (P1: 28). It requires a good knowledge of data to know how to use and get benefits from it (P1: 28). This opinion aligns with the perception of another participant, who states that it is essential to handle the data properly because just collecting a lot of data is not sufficient if the auditor incorrectly uses it (P5: 42). Three respondents mention that adaptation to any kind of new technology, not only big data and analytics, may require some effort of learning and sometimes can be challenging for some people (P3: 28; P4: 26; P6:28).

4.1.2 AI and RPA

Regarding artificial intelligence and robotic process automation; for both of these technologies only three participants confirmed their usage in their workplace. Regarding AI, respondents P1, P6, and P7 (P1: 38; P6: 34; P7: 30) were the ones to confirm its usage, and respectively for RPA it was solely P2, (P2: 54; P6: 34; P7: 38). P1 states for AI that it helps auditors focus on the right things and what is important.

> *I think AI especially helps us focus on the right things so instead of doing repeti-*
> *tive tasks filling in the checklist we can instead focus on asking the right ques-*
> *tions, look into what's important, and what's really material for both the client*
> *and from an inspector perspective.* (P1: 42)

Besides the above, P6 showcases another usage of AI. That of being an assistant to whom an auditor can go and ask questions when needed.

> *...we have AI bots when we ask something they help us like there's no human be-*
> *ing behind but they're like the automated answers.* (P6: 36)

Something that also P2 identifies as possible usage of AI for auditing, even though it is not incorporated in his organization.

> *Because of course in audit, you will end up in a lot of situations that yeah you*
> *need to think, you need to have yeah take a minute or more minutes to think*
> *about the situation "what can I do". And if you have a robot that can go in and*
> *help you with different thinking, whether you can talk to the robot or the robot*
> *can show you...That could help a lot...* (P2: 64)

Another useful service provided by AI according to P7 it's that of identifying outliers in data (P7: 34).

For RPA, P3 and P6 explained that it helps reduce the risk of an error happening due to human error, and thus, they can rely way more on the data since it has been produced automatically (P3: 38; P6: 34).

> *...every time there is an automatic control of something that makes the risk much much lower for us because you don't have the manual person sitting there doing something. We have to do less testing if there is an automation instead of manual.* (P3: 38)

Additionally, P7 asserts that RPA, combined with AI, helps with efficiency. RPA can prepare the data in a way that matches their data model and makes them ready for analysis after an AI platform has found the outliers.

> *...I would be the one preparing the data and putting the parameters into to see what outliers we can identify in the analysis. So, it removes a lot of manual activities that I otherwise I would perform. So, it saves a lot of time for us.* (P7: 36)

The main challenge for these technologies mentioned by most of the participants is the time needed to get accustomed and learn how to use them properly (P1: 46; P2: 62; P3: 42; P6: 40). Another challenge expressed by P4 is that by automating a lot of processes, even the most basic ones, could lead to newer auditors not learning properly what is auditing about.

> *I think there is a risk going forward (interviewer hmms) that new employees will not learn the work from the bottom. So, it will be hard to analyze the output because you might have a hard time understanding when it comes from. (P4: 50)*

4.1.3 Blockchain

When asked, if blockchain is something that has been incorporated (as in something that they make use of) in their auditing department, all the participants replied negatively (P2: 44; P3: 30; P4: 34; P5: 48; P6: 28) with the exception of P1 where the interviewee claims that they have some tools for it (very limited compared to big data and analytics). However, the interviewee also clarifies that he personally is not involved with it (P1: 30). Except for this one, P7 replies that they have it in their department and know about it but they only advise about it and they do not use it (P7: 24). As a reason for not using blockchains P2 convincingly explains that they simply have not found a way to make it work and that they have even looked into examples of banks that have used it successfully (P2: 46). In line with P2, the interviewee P3 declares:

> *I'm not sure but I think we're sort of on like going towards that but we just haven't really implemented it yet. I think that we're still like trying to figure out how to use it effectively.* (P3: 30)

Another reason for the non-use of it, denotes P7, is simply because their clients are not using it but maybe they could encourage them to do so but it is not the role of auditing firms to do that: "If they're not using it, what we can do is maybe if we could try to build the general ledger to encourage it. But I don't think that's our role in the market. There are tech companies that do that better. I think we are with more advising around the blockchain how to use it than to actually build it." (P7: 24)

Despite the lack of implementation, some of the responding auditors recognized the potential benefits of blockchains use in auditing. P7 thinks that blockchains could make going through the financial data a lot easier since the data would be already validated (P7: 26). The same thought is expressed by P2 as well. The participant believes that if blockchain is working properly then everything should be correct and thus, making auditing easier (P2: 48). Moreover, P1 mentions that blockchain could follow the trails of a company on a day-to-day basis instead of following them every couple of weeks (P1:34). Finally, P3 considers that blockchains could make things more transparent.

On the other hand, P7 emphasizes the fact that even though the power of blockchains is the validation of the data they provide that is also their biggest risk because it might lead to auditors having blind faith in it and thus not recognizing fraud being made (P7: 28).

4.2 Perceived benefits

4.2.1 Competence and upskilling

All of the participants admit that they have received prior training to develop new skills on the usage of new technologies from their workplaces (P1: 50; P2: 72; P3: 46; P4: 58; P5: 80; P6: 46; P7: 42). For example, P6 mentions that the workplace offers educational digital centres where they are provided with new learnings, workshops, and online training (P6: 46). However, P6 further claims that only workshops are not enough to comprehensively understand technologies, they need to further familiarize themselves and work on self-learning (P6: 46). Both P2 and P7 further support this fact by focusing on self-learning to improve their skills beside the trainings:

> *We, for example, this weekend that will come we will be at a big hackathon that will be during this weekend. A lot of companies around Sweden are doing a hackathon on the Corona-virus. And I don't know if there will be extremely big teams that will be in this competition and the end goal is to find something that can help us in this situation that we are in now. So there the team we have from KPMG will use AI and another type of technique and so on and try to do something. It's a presentation of over two minutes of video production and then it's a jury that will see if something of this is realistic or not. So, of course, that type of event is then you get a lot of insights, things we at KPMG also have an alliance with.* (P2: 74)

> *I had a project I'm working on at home that involves both RPA and some sort of big data analytics. So, I'm having my small projects where I try to work with these technologies. Even now I'm personally working on a project about the analytics of Covid-19.* (P7: 44)

On the other side, only two of the participants do approve that they have received some basic knowledge from their educational background, while the rest had no experience and knowledge about the digitalization and technology in their educational years (P3: 46; P2: 42). However, P2 claims that even though during his/her educational years the technology and digitization were almost non-existent in their curriculum and they had only a tool of calcula-

tors, he/she learns new things every day from his team that has newer education (P2: 72). Moreover, P5 mentions that regardless of the educational background in digitalization, the auditors can still keep up with technology with the help of training and upskilling they will receive in workplaces (P5: 146).

Lastly, all of the participants perceive the usage of technology and training as a positive change and are open to using new technologies in their work more (P1: 56; P2: 76; P3: 50; P4: 62; P5: 90; P6: 48; P7: 48). P1 stands emphatically for the skills development of employees by stating that if they stop the evolving and upskilling process of workers, then it is when the problems are going to arise (P1: 56). This interviewee implies that the increase in skills and competence is a driver for auditors to develop themselves (P1: 68).

4.2.2   Improved audit quality

Digitalization adds quality to the audit process or profession (P1: 62; P2: 88; P3:56; P4: 68; P5: 106; P6: 54; P7: 54). While P7 acknowledges the quality measure of speed is improved when they deliver insights and outcomes to the customers, P4 believes that it can improve the quality only when the proper usage of it is met, otherwise it can lead to the loss of quality (P4: 68; P7: 54). In addition to speed, another quality measure to be considered is the higher value of products (P3: 68; P4: 82; P5: 124). Hence, "...*we can be more relevant to the clients and that in that case we add more value and help for the customers and in that way, we maybe be even more auditors* " (P5: 124)

Another quality measure of auditing for smart analysis is the opportunity of sampling the whole population instead of a small fraction of samples (P1: 60; P2: 100; P5: 70). P1 explains the sampling advantage for auditors who use digital tools in absolute terms:

> *...it's essential I mean it's something that we just have to do both from a client perspective and from a quality perspective. I remember a training we had when we were first introduced the facilitator told us that imagine auditing a company like Siemens like you have millions of transactions and the way we used to do it is that we sampled a couple of transaction looking at maybe like let's say we looked at hundreds of transactions out of 10 million. So, by incorporating digitalization we can instead look at the entire population so instead of looking like only a fraction we can look at the entire thing. So, it gives us both client insights, clients, perspective, quality, efficiency. I mean it's absolutely key.*

> (P1: 60)

P4 also mentions the relevance of data analysis when they make audit-based decisions (P4: 44). In line with P4, P3 assures that they can be more specific and look towards the risks and the outliers by focusing on what is relevant (P3: 56). P1 further mentions that they use various data tools to improve the quality of income statements, balance sheets to planning and communications with the clients (P1: 24).

Finally, one of the participants perceives that digitalization can further contribute to real-time and continuous auditing.

> *...we will go more to real-time audit and we will have much more things already prepared and done. We will have much more third-party information that could be today*

*you can google around Sweden but when with this tool and using everything we can
have it as a KPMG and bring it into the audits that we want. Because we know which
industry, which town this company is in and so on. We can help the audit team so
much more with all this information we have outside our world. But are available
when you search for it* (P2: 96)

4.2.3 Flexibility and efficiency

All of the participants have acknowledged in various ways digitalization's positive impact on
the flexibility and efficiency of the auditing process. For instance, P1 states that through the
automation of simple but repetitive tasks, brought by digitalization, auditors now can focus on
what is important and not "waste time" in monotonous tasks (P1: 42). Likewise, P2 mentions
that digitalization not only speeds up different processes but also frees up physically the per-
sons that would carry out said tasks and makes them available to do other more valuable as-
signments (P2: 54). P3 describes a common scenario, in the past decades, where the auditor
would have to flip through pages in order to find what was needed but now can instantly
search or filter through the data (P3: 60). The interviewee P4 emphasises the fact that digitali-
zation has allowed auditors to be more intelligent when making samples and consequently,
reducing the sample size (P4: 70). Finally, the participants P5, P6, and P7 do also agree on the
notion that digitalization has reduced the number of repetitive tasks and thus made them more
flexible and efficient (P5: 110; P6: 58; P7: 36). However, P5 emphatically denotes that even
though digitalization reduces repetitive tasks a bit, it also adds tasks because digitalization is
still in the early stages and it's not refined yet.

> *Yes, a bit. But now when we are like in the beginning of it, I think it also adds tasks
> because we don't have the correct set up yet in every system, etc. So, until we are there
> you have to yeah give input to the computer then you don't save time in the beginning.*
> (P5: 110)

4.2.4 Auditing reputation growth

Three interviewees of the study advocate that another benefit of digitalization is the boost of
reputation that it has brought on auditing (P1: 72; P5: 120; P6: 60). According to P1:

> *...the profession [auditing] used to have a boring reputation and I think as we
> move towards different ways of auditing we're changing that perspective and
> that reputation. That is a huge advantage in terms of attracting talents, attract-
> ing clients, and also for us to develop as a person.* (P1: 68)

The same person reveals a positive attitude by concluding that:

> *...because as we just discussed the reputation and so on increase and I think it's
> getting more attractive to become an auditor.* (P1: 76)

Positive thoughts are also shared by P5 which mentions something along the same lines:

> *I think in most cases will be attractive to yeah new people that we will hire. Be-
> cause I think that it's more fun to work if you have like help from the computers
> to do a lot of the work and you work and. But time to meet the customers and*

> *analyze is the fun part of the job. So I hope it will develop us into more attractive work.* (P5: 116)

To summarize, one may consider that digitalization makes working as an auditor more interesting and attractive to younger people but also to clients. In other words, it contributes to the reputation advancement of the auditor profession.

4.2.5 Increased reliance

The interviewee P6 believes that the reports retrieved from digital software are more reliable and trustworthy than manual ones which can include risk of human errors (P6: 22). To support this opinion, P6 provides the example of fraud actions in payment transactions with less involvement of technology:

> *Let's say when we have human intervention in the processes, specifically, in payments. When we know that the payment cannot be initiated by someone without any approval and then the technology or the software will not let the person making a payment without any approval. Then we know that there is less risk that there will be some fraudulent activity in payments when we are sure that the software won't want to allow a person to initiate a payment without approval. Rather than if it's paper-based, it always can be falsified. Also by using digitalization or digital technologies by our clients, then internal processes are more controlled than not having any technology at all and having the paper-based work.* (P6: 56)

Although P7 considers automated controls as an effective practice to test the controls of the business they audit and trust or rely on the financial numbers that the audit building upon, he/she mentions about the cases when the blockchains are used: "For example, it's when people have hacked into the community and you still think that is safe but there's actually fraud being committed. As the auditor, you kind of trust the blockchain completely and you do not try to validate the IT control because you have gone from substantive testing and then you can miss a lot of potential frauds that would be devastating for an auditing business." (P7: 28). In line with P7, the interviewee P5 also spots on the risk of complete dependency on computers and lack of being skeptical through them (P5: 106).

Another interesting standpoint is that of P3 who believes automatic control lowers the risks since there is no manual intervention required: "We have to do less testing if there is automation instead of manual. I mean quite often we work very risk-based and since there is less risk that comes with automation as compared to manual. Then it has a big impact on what we have to do and how we make sure that everything is correct." (P3: 38). However, the specific respondent acknowledges the risk of the availability of technology that can lead to malicious users to gain confidential audit data (P3: 68). Hence, he/she has concerns regarding data security that can be impaired while the user fully relies on technology without protection (P3: 68).

4.2.6 Reduction of expectation gap

Three out of all the participants made a statement that digitalization has indeed contributed to reducing the expectation gap between the customers and the auditors (P4: 80; P5: 120; P6:

76). When they were asked to elaborate more about what is meant by the expectation gap, P4 de-scribed it as follows:

> *I believe today there is a large expectation gap between what companies believe we are doing and not only the companies ehh and like people in general. I think the expectation is that we are auditing and we are looking at every transaction and that is not the case. We look at what we think is relevant and we focus on the risk which we have found. So, we are not covering all of the transactions and all of the things that are happening in the company. And I believe that people around us expect us to do that. So, they are quite disappointed when we don't identify a smaller mistake in our view. But that is the way we work. So when we can use technology to analyze all the data, we can focus on the outliers instead of just, today we have to focus even on the things that are right to ensure they are right but when we have the tools to analyze the data we can focus on the outliers and therefore we can cover a much larger amount of the companies.* (P4: 84)

Something similar was also indicated by P5 which said:

> *Because I think today...You have a gap between their expectations of what an auditor does and what we do in reality. So, they think that we look at everything but we don't, we make samples. So, if we can test everything with an AI computer, then of course the customer will be more satisfied... and comfortable as well.* (P5: 120)

Consequently, the term expectation gap describes a situation where the customer/companies assume that everything is appropriately checked and tested during auditing. But in fact, auditors work with samples, whether random or selective and based on them they make assumptions on whether everything is as it should be or not. However, this modus operandi of auditors has started to change thanks to digitalization. Because auditing professionals now have started to have access to more data, if not to the whole data population, so they are quite close to meet the expectations of their customers. A noteworthy comment is that of, P6 which considers the customers as the main driver for digitalization (P6: 76). According to this interviewee, their high expectations drive auditors to try to achieve more efficiency and effectiveness which translates into higher quality auditing and which results in gaining more trust from the clients.

4.3 Perceived challenges

4.3.1 New auditor profile

One of the main challenges that study participants perceived was the new auditor profile. According to P2, P5, and P6, a new auditor profile requires new skills in more complex areas such as requirements of having competence in various technologies or providing auditing services that are more IT-oriented (P2: 112; P5: 150; P6: 72). P7 also implicitly pointed out this challenge while referring to the present crisis of Covid-19: "*Everyone is especially during these times when you're kind of forced to work digitally and every company right will come*

out from this more digital-savvy or more computer savvy" (P7: 74). Some of the participants even believe that there is going to be a transformation from auditing to more consulting, hence shift from auditing tasks to more advisory related tasks (P2: 104; P3: 60; P4: 66). All of the participants were uncertain about the actual impact of digitalization on the number of auditors employed. However, they answered that it might have implications on different types of professions or unveil different areas or competencies to work with (P1: 84; P2: 104; P3: 64; P4: 76; P5: 124; P6: 66; P7: 62).

> *I think our responsibilities might change in a way that we will focus on more complex areas and, but I do not think it will extremely affect the number of the auditors employed, maybe small decrease, but instead their responsibilities and audit profile.* (P3: 64)

P7 further claims that digitalization resulted in a requirement arising for possessing understanding or interpretation of technology that:

> *Everyone needs to be aware of when working with these kinds of technologies and especial-ly when it comes to financial auditors that do not have an IT background. When the platform has performed its analysis, it provides them with the results but if the data was biased from the beginning and the results are incorrect and you're using incorrect results for your audit but you don't maybe know if the data was biased because you trust everything and have no knowledge how the platform came into these results. It requires an auditor to gain that basic understanding in other ways so you need to adapt and kind of understand what you're doing.* (P7: 38)

In addition to this requirement, P1 further mentions that auditors should have a high level of competence when they work with millions of transactions in order to easily find problems and solve it: "*...you need to be able to find the needle in the haystack you need to have that level of competence to know where to look...*" (P1: 80). In line with P1, the interviewee P7 also claims that auditors should have skills to work with robots: "*...since it would be robots per-forming the processes within the businesses and it would be robots performing more and more auditing*" (P7: 60). Summarizing, it might be claimed that the majority of the participants believe that it is hard to be an auditor nowadays since the skills to deal with digital transformation are mandatory (P1: 82; P2: 110; P3: 72; P7: 70).

4.3.2   Resistance to change

From the interview responses it is identified that 5 out of the 7 participants consider some form of resistance to change as a challenge for digitalization (P1: 46; P3: 42; P4: 52; P6: 24; P7: 22). P1 states:

> *I think it's the transition we have to do whatever the cost but of course whenever you're initiating anything new it's always the complexity and how to do it and so on that has been in first-time investments I think both from my personal time aspect and from the firm as well.* (P1: 45)

Moreover, five interviewees think to adapt to the new way of doing things, through making use of digitization tools, as an inevitable process. However, opinions are divergent when dis-

cussion comes to identifying for which auditor is harder to adapt to such changes. To the senior/younger auditor or to the older and consequently more experienced auditors? P3 and P4 share the opinion that is easier for senior/younger auditors to learn to work with the new tools brought by digitalization. The interviewee P3 clearly denotes that older auditors might have more issues adapting as most of them are used to doing things the "old fashioned way".

> *I would personally say that with these technologies like RPA, AI, Big Data, and Block-chains, we as the younger generation are more open towards it. So, it's more the older co-workers that might have a bit more issue adapting, as most of them are used to doing things the old-fashioned way. Therefore, resistance to change of technology can be observed in the more older generation of auditors.* (P3: 42)

In addition to the above-mentioned, P5 also explains that is harder for the close to retirement auditors to adapt in contrast to the newer ones who develop their skills very fast nowadays, according to the interviewee:

> *So, I have worked my half...the life and of course I have a lot of years to work. But if you are like sixty and you have like 5 years left then maybe you do not adapt and then of course, it's I guess they see it as more difficult. And I think that the new colleagues they develop very fast today so I think that they think that is easier now that when I was new. They are more skilled.* (P5: 142)

On the contrary, P6 claims that it is harder for the newer auditors to adapt to these new technologies, brought by digitalization, due to the fact that they are constantly being asked to perform many different things in different software.

> *...there are some people to [sic] it's really quite a lot for them to learn and adapt to new joiners especially when we ask them to perform so many things in different software. So they get confused and they really find it difficult to learn how to use it.* (P6: 24)

An interesting input is given by P6 who thinks that because older auditors are more experienced, it is easier for them to understand how to use the new tools.

> *From my experience, I had a feeling that more like older people in the company they find it more difficult to adapt but the thing is that they have more experience. So, it balances with experience. Since they have the experience, they might guess it more easily how to do it. For the technology, I think young ones are more into quickly learning how to use it but they might lack audit experience. (P6: 26)*

5 Discussion

5.1 Digitalization technologies in auditing tasks

As Gartner (2012) argues that digitalization occurs when businesses start using digital technologies in order to improve business models and gain new revenues. In a similar manner, the empirical findings show that auditors adopt digitalization when organizations change their processes from manual to digitalized forms. The empirical findings align with Gartner (2015) who argues that digitization is a conversion from analog to digital form of a single process, whereas digitalization is about moving the whole process to be digital. An observation from the data reveals that digitalization changes the overall working methods of auditors. This standpoint aligns with Lombardi et al. (2014) and Wagner's (2016) study that considers the auditing profession to be in a change status from the traditional auditing relying on papers to the modern auditing with paperless and automated processes. Our findings suggest that the clients should be considered as a trigger or driver to use innovative technologies in auditing. If the clients do not include modern digital technologies in their businesses, it is useless for auditors to be digitalized for auditing such businesses. This is not consistent with Arsenie-Samoil (2010) who considers digitalization a must for auditors to accept and familiarize themselves with it and its unavoidable effects. In terms of digitalization applications that auditors currently use, the auditors interviewed named Salesforce, Workday, and Microsoft tools that help auditors such as Microsoft Teams, Azure, DevOps besides developing their internal digital auditing tools. Most of the participants approve the unavoidable effects of disruptive digitalization technologies such as big data & analytics, blockchain, AI and RPA, in line with (ACCA and CA ANZ, 2019; Mansour, 2016; Adiloglu and Gungor 2019; Ramamoorti and Weidenmier, 2004; Forbes, 2018; Alao and Gbolagade, 2019; ICAEW, 2017). Hence, the effects of digitalization are analyzed from the aspects of technologies like big data & analytics, blockchain, and AI & RPA.

Big data & analytics: In accordance with Alles (2015), our study confirms that big data & analytics are an essential tool to use if the auditors attempt to perform the audit tasks with quality and efficiency. Within the literature, one of the main tasks of auditors is considered to be an examination of financial statements through journal entries (Cleartax, 2019). In line with it, our findings indicate that auditors make use of analytics software to examine journal entries that are extracted from big data of the clients. Regarding the usage of big data & analytics in the auditing environment, our empirical findings provide various purposes such as performing risk analysis, benchmarking, generating reports. Based on the empirical findings, auditors perform risk analysis in order to find out relevant problems or outliers with the help of big data & analytics, in line with Meuldijk (2017). The empirical findings appear to support the argument of several researchers (Bierstaker et al., 2001; Yoon et al., 2015; Cao et al., 2015), that one of the implicit usages of big data & analytics can be improving auditing vision with non-accounting data, for example, benchmarking by the analysis of non-accounting historical data between the years for one company or against other companies in the same brunch or same sizes. According to the empirical data, one of the auditing companies developed internal software where they generate financial reports by inputting big data from their custom-

ers. This is in line with Adiloglu & Gungor (2019) that aim at defining the development of financial reports as the main auditing duty. While most of the participants acknowledge their direct interaction with big data, one of the participants claims that they do not use complex or raw big data but instead already summarized data that was big data previously. According to the auditor, they perform inventory analysis to ensure the correctness of inventory transactions which is similar to big data & analytics in terms of cleaning of data but is not the same with complex or raw data. This seems to be consistent with Porter (1997), who states that one of the responsibilities of auditors is the analysis of the correctness of the financial statements in order to avoid any fraud actions. Moreover, according to the empirical findings, the relevance of data is enabled by using specific sampling instead of random, for instance, auditors are allowed to choose specific samples from different areas of data. This is a new aspect of big data & analytics which is not mentioned in the literature review. While most of the interviewed auditors did not face the direct disadvantage of big data & analytics in their profession, they mentioned the difficulty of managing such complex data forms that require extra knowledge and effort in order to be able to gain advantage from it. This aspect of big data & analytics is presented in the literature, in the study of Appelbaum et al. (2017). Thus, looking at literature and findings from the participants, it is confirmed that big data & analytics is a prevalent tool in auditing that eases auditing tasks by enabling risk and inventory analysis, benchmarking, generation of reports, and specific sampling.

Blockchain: Schulan and Wilson (2019) claim that blockchain technology is still in initial stages but still shows great potential to effectively transform the way organizations do their business and as a result, how they get audited. Our findings show that the first part of the statement is true; that is that blockchain is still in initial stages and that it has not been adopted or used by organizations and thus it is also not used by auditors. However, we cannot confirm nor deny the second part of that statement as most of the participants of the study did not showcase great knowledge about blockchains all-together. However, two of the participants, arguably the ones with most IT knowledge, said that a blockchain network could potentially make auditing easy and very accurate since establishing a secured functioning blockchain would mean that all transactions are already validated and thus valid. Something similar was also stated by McGhee and Grant (2019) about HyperLedger, stating that a DLT makes tracking an audit trail easy due to its immutable data and disallowing of removing past data.

AI & RPA: According to our findings, AI & RPA are more of relevance to auditors than blockchains but still less relevant than BD & analytics. Moreover, we found similar results to PwC's (2017) report that states that RPA can be used to automate things like reporting or sending emails. In addition, it is also apparent that RPA helps with the reduction of boring or repetitive tasks as McGhee and Grant (2019) also state. Such a use case is when RPA is used in order to automatically copy data from one database or portal to another database settled up for auditors to make use of. For AI, an interesting finding and one not so much showcased, if at all, by literature is the use of AI bots as a "person" for auditors to turn to in order to ask questions about how to proceed with an audit when stack or unsure. Finally, as Boillet (2018) states and which is also supported by the participants, AI can be used to help prepare the data for auditors to make use of. More indirect benefits of AI & RPA will be mentioned and examined in far more detail in the following paragraphs.

5.2 A brief analysis of perceived benefits

This theme proposes exploring how the benefits of digitalization, determined from the literature, for instance, competence/upskilling, improved audit quality and flexibility and efficiency, are perceived by auditors. Therefore, the empirical findings attempted to approve these benefits and explore new ones. It is worthwhile to mention that all of the interviewed auditors have high satisfaction through the digitalization of the auditing field. According to our observations of empirical study regarding the theme of perceived benefits is auditing reputation growth. The empirical findings show that digitalization improved the reputation of the auditing profession among new generations by involving more interesting and less-repetitive auditing tasks in order to reduce the monotony of auditing practices. Another new perceived benefit of digitalization according to our findings is increased reliance. The findings indicate that digitalization and technology involvement in the auditing operation increases reliance or trust and reduces risks on the auditing products and services. Lastly, the reduction of the expectation gap is one of the perceived benefits based on our findings. We use the term expectation gap to describe the difference between what the auditors' clients think that auditors are able to do and what auditors have the ability to actually do. This will be further examined below.

Competence/Upskilling: Overall, according to our findings in this study, upskilling is beneficial in terms of auditor development. This is also supported in different studies (Nearon, 2005; Karlsen & Wallberg, 2017; Ghasemi et al., 2011; Sutton, 2000; Manita et al., 2020). All of the participants admit that they have received training prior to they had started implementation of new technologies or software. The literature confirmed the importance of training to support the upskilling of auditors with the guidance of newly adopted technologies (Burke, 1995). However, based on our findings, it is claimed that having the workshops or formal support from the workplace is not enough for the auditors to upskill or improve their competence of technologies. The auditors should also work on their self-improvement to further familiarize themselves with newly-adopted technologies. Based on our empirical observations, auditors are working on different projects that involve various technologies besides their job-related duties in order to progress on digitalization with the help of self-learning. In this context, ACCA (2016) places great emphasis on competencies by highlighting how modern-day auditors will gain professional skills including technical skills and knowledge with the help of digital transformation in the auditing field. In line with the literature, the existence of knowledge or training for upskilling potential auditors regarding digitalization and its components is not identified in educational institutions. Our findings suggest that regardless of the lack of knowledge about digitalization from an educational background, auditors can get upskilled and improve competences with the help of formal support from workplaces, in line with Manuti et al. (2015). Hence, our finding is consistent with literature that all of the interviewed auditors perceive the upskilling process as a positive change and open to further usage of new interventions and software in their workplaces.

Improved audit quality: Several studies consider digitalization as a quality driver for the auditing field (Manita et al., 2020; Karlsen & Wallberg, 2017; Tiberius & Hirth, 2019) and all of the participants of our research have approved this. However, the analysis of the empirical data also shows that if the technology is not properly comprehended by auditors, it can contribute to the loss of quality. Quality can be observed from two aspects: smart analysis and continuous auditing. Regarding the smart analysis, the majority of respondents stated that the opportunity of sampling the whole population instead of small fractions is enabled by digital tools in order to enhance the analysis process. Therefore, smart analysis enabled by the digi-

talization of auditing improves the quality of insights, products, or services and perspectives for both clients and auditors. This standpoint is in line with Manita's et al. (2020) findings that explain that auditors can use global data for proper analysis to provide superior insights through clients' activities. According to two of the interviewed auditors, digitalization helped them to be more relevant or specific while doing analysis and discovering the risks and outliers. Such findings are supported by Manita's et al. (2020) study where the relevance in analysis is considered as a force to improve awareness through the risks and outliers. In addition, some of the auditors claimed that continuous auditing also supported by increasing the speed of delivering products and services. Thus, digitalization can lead to real-time or continuous auditing by removing time-waste on repetitive tasks, enhancing speed on the audit product delivery and providing more available sources to audit, in line with (Tumi, 2014; Tiberius & Hirth, 2019).

Flexibility and efficiency: According to the literature, digitalization is argued to offer an increase in flexibility and efficiency for auditors (Chan & Vasarhelyi, 2011; Rezaee, 2001, Ghasemi et al., 2011; Granlund, 2007) which stems mainly from the transformation of paper-based auditing into digitalized auditing. Our empirical findings support such claims. With pretty much all of the participants of our study making mentions of how digitalization has led to an increase in flexibility and efficiency. The fact that flexibility is tremendously enhanced can also be supported by the fact that all of our participants, due to Covid-19, were working from home without making mention of any work-related problems. Something which some of our participants revealed that they previously thought to be impossible. In terms of efficiency our participants made mention that whether it is through BD & analytics or AI & RPA, digitalization leads to an increase of it. Increased efficiency translates into doing more in less time. However, some of the participants also mentioned that since these digitalization tools are still new, they are not fully refined yet. Thus, at least in the beginning, they may need more time to use them than it would take if the auditor went ahead and did it manually. Finally, one participant mentions that digitalization has led to the standardization of things which in total has a positive effect. But still, might reduce the flexibility that auditors have when conducting an audit since the programs they use requires them to fulfill hardcoded guidelines of said programs.

Auditing reputation growth: A relatively new finding of our research is that digitalization leads to the increase of the audit profession reputation. In our literature review (see Chapter 2.4.2) only Chan & Vasarhelyi (2011) seem to make some mention that through the assistance of various digitalization tools the reputation of the audit profession has increased. Our empirical findings seem to align with this statement. More specifically, some of the interviewees men-tion that through digitalization and the automation of some boring and repetitive tasks such as moving data from one database to another or fetching some papers, making copies, returning the papers and then looking into them to find what is needed, the profession has become less boring. Which consequently means a more attractive job prospect, especially for younger people who are glad to be working with computers. However, this increase of reputation does not only refer to the increased attractiveness to young people but also to the clients. Because as some of our participants state and as we discussed earlier in previous paragraphs, digitalization has increased the audit quality and the produced result of it. Which in turn, results in clients having more faith and respect in audits and auditing as a profession altogether.

Increased reliance: According to the perspectives of our interviewed auditors, there is new perceived benefit explored in our empirical findings which is increased reliance. One of the preliminary duties of the auditors is to examine and validate the correctness of the financial

statements or transactions operated by the clients (Cleartax, 2020). Based on our findings, digital technologies help auditors to reduce the risks of human errors and increase reliability while involving technologies in auditing operations. Thus, digitalization of auditing proposes more control over any fraudulent actions of audit data by reducing human interventions and relying on smart software. On the other hand, our findings show the risk of full dependence on technology by emphasizing the importance of control and consciousness over technology. Complete reliance on technology without any control and awareness can lead to the risk of fraud actions. Thus, technology contributes to the less risk and testing when automation reduces human intervention and errors while it still requires to have control and consciousness over technology.

Reduction of expectation gap: Based on the statements of two of our participants, we discovered a new benefit of digitalization on auditing; the reduction of the expectation gap. We consider this as a discovery since we found no mention of it in our initial literature review. The term "expectation gap" is used to describe the difference between public perception of an auditor's role and responsibilities regarding audit engagements and what the auditors' real responsibilities actually are (Irfanullah, 2019). the expectation gap can be split into two categories: performance gap and the liability gap. In short, the performance gap is about what an auditor can actually do while auditing and what the public believes they can do. While the liability gap is the misperception in regards to the legal liability that an auditor has. Our findings are about the expectation gap. As what we found is that, auditors make use of sampling, which implies that instead of testing all the records of a financial year, only a subset representing the whole population is actually getting tested. This leaves room for errors and false results since the selected sample might not accurately represent the whole population. But this changes now with digitalization tools since now it is possible for auditors to actually test almost the major part of, if not the whole, population of data and thus, guarantee that the financial statements actually portray the complete picture about the circumstances of a company. This is considered quite essential in the auditing world since there is always a risk to be sued. We do consider this of great importance, as it is not rare for auditors or auditing companies to get sued from stakeholders that invested and lost money by basing their decision on audited financial statements that proved to be wrong in the end.

5.3 A brief review of perceived challenges

This theme proposes exploring how the challenges of digitalization, determined from the literature, new auditor profile and resistance to change, are perceived by auditors. Therefore, the empirical findings attempted to approve these challenges and explore new ones. Our empirical findings show that digitalization leads to the change of profile for auditors. Mainly requiring more computer or technology skills from auditors. Lastly, the other challenge which is directly correlated with the new auditor profile, is resistance to change. Resistance to change refers to the difficulty auditors may show in accepting and adapting to the changes digitalization brings to the profession.

New auditor profile: The progress on technology affects the general profile of the auditor profession. Many auditors are conscious of how the development of technology contributes to the changes in the requirements of the auditing profession. A new auditor profile re-quires modern skills and competences in more difficult fields, for example; being technology savvy or offering auditing services with more IT orientation. This finding is also supported by

Raphael (2017). According to our findings, the auditing profession may have a shift from auditing to more consulting nature by changing the responsibilities and duties of auditors. Even though automation and digitalization will not result in the reduction of auditors employed, it will alter the responsibilities and generate different areas to work with for auditors. Furthermore, auditors are required to possess skepticism and control over the technology in order to be conscious of technology errors and frauds and provide reliable auditing products and services. The literature confirmed this statement, with a study showing that auditors will need to uphold the highest levels of honesty, independence, and skepticism over technology (McGhee & Grant, 2019). One of the participants claimed that future auditors will also be required to work with robots performing the processes within the businesses. Hence, based on our findings, the majority of the participants think that it is harder to be the auditor in the modern-day auditing.

Resistance to change: Resistance to change is considered to be the key challenge that auditors will have to overcome in order to rip the benefits of digitalization in their field. As both Alles (2015) and Lombardi et al. (2015) claim, the auditing community has suffered in the past due to its lack of proactiveness towards adapting to technological changes such as the computers and the Internet. Using as an excuse that auditing's first priority is to be steady and that making changes could jeopardize that reputation (Raphael, 2017). However, our empirical findings suggest that none of our participants has or will have any problem adapting to the new ways of carrying-out auditing brought by digitalization. As long as they have the assistance and support of the organizations they belong to, and they do not overload them with too many changes too fast. Having stated that, some of the participants claimed that while themselves might not face any challenges, as long as the conditions previously stated are met, they believe that some of their colleagues will find the adaptation process hard and might struggle to do so. However, from our empirical findings it is not possible to reach a conclusion as to what determines who is going to struggle and who will not. As regarding adaptation difficulties, some of our respondents conceive that younger auditors will face no severe adaptation problems with the changes. Wherefore they are more familiarized with all sorts of technology in general. On the contrary, some consider that the more experienced auditors will find it easier to adapt due to their superior knowledge in auditing which in turn, will allow them, in theory, to understand faster what these new technological tools try to achieve and what is exactly required from them, as auditors, to do.

5.4 Updated conceptual framework

In this research, the conceptual framework described (see Figure 2.1) in the second chapter used as a guide for the empirical study. However, it was dynamically revised on the basis of the collected empirical data. In Figure 5.1 below, the final elements of the framework applied and their interrelations are duly portrayed. This was necessary due to the fact that while referring to the conceptual framework generated from the literature review, we observed from the empirical data that big data & analytics is the most, AI & RPA is the average and blockchain is the least used or prevalent among the interviewed auditors. Therefore, the order of technologies has been changed following the level of their usage and familiarity among interviewed auditors. Keeping the concepts of conceptual framework in mind, the additional perceived benefits have been disclosed on the basis of the collected data. Hence, the updated conceptual framework has been graphically re-adjusted to improve the comprehension of the readers by providing, in a more efficient way, the concepts of digitalization in auditing context.
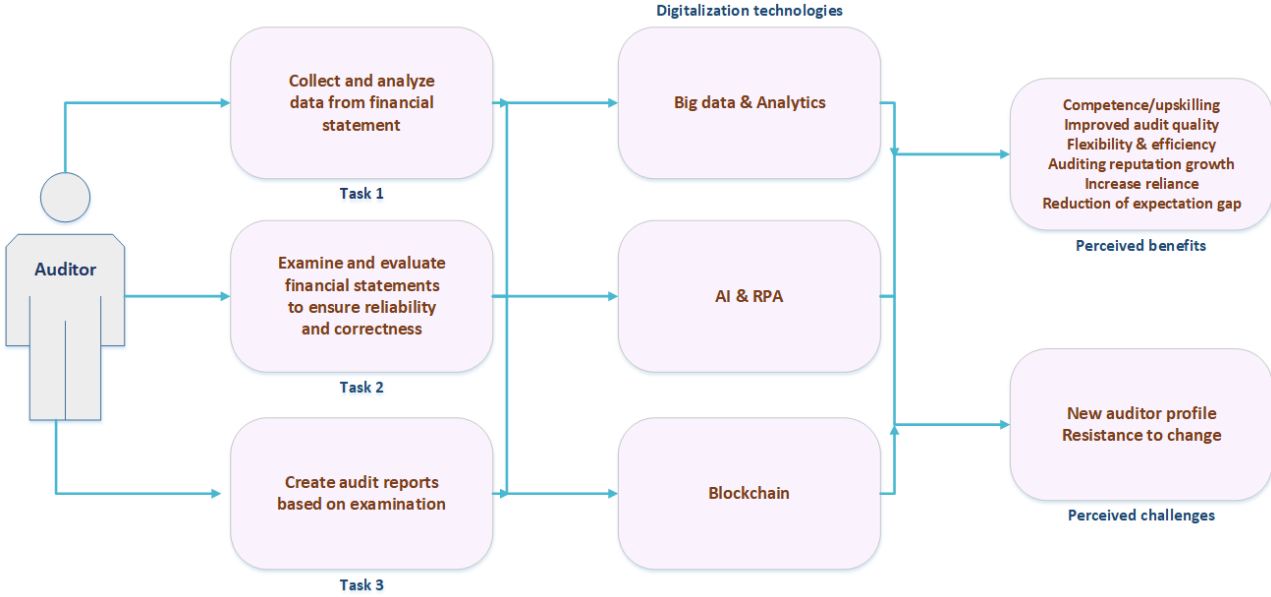
Figure 5.1: Updated conceptual framework

6 Conclusion

The purpose of this research was to achieve the deeper insight and scrutinize the benefits and challenges of digitalization-driven changes that auditors perceive within their profession, which resulted in the following research question:

"What are the auditors' perceived effects of digitalization and related technologies on the audit profession?"

For getting answers to this question, we initially conducted a literature review exploring what benefits and challenges auditors encounter when auditing organizations have introduced prevalent digitalization technologies. The systematic review of the literature contributed to the initial formulation of the conceptual framework (see Figure 2.1) which then used as a roadmap for the empirical data collection. On the basis of empirical findings, we explored new benefits and further developed the conceptual framework to its final version (see Figure 5.1).

6.1 Key findings

By comparing our empirical findings with the findings of previous research it is sufficiently demonstrated that this study supports some of the findings of previous research concerning the topic of digitalization in auditing. Previous research claimed that auditors consider that digitalization will be even more prevalent in the future than it is now, which is also supported by our findings. Moreover, the findings of the current study also align with the argument made from Karlsen & Wallberg (2017), which claim that auditors expressed no fear of lost job opportunities, which goes against what previous research suggests. Our findings suggest that due to the increase in attractiveness and reputation of the profession, job opportunities will probably increase or, in a worst-case scenario, remain. On the other hand, the interviewed auditors also highlight that there might be a change in how job positions will be called or what their specific role and responsibilities will be. In addition, our findings show that auditors are satisfied with the overall impact of digitalization on their field and they seem to be open in using more technology in their work routines. As long as they receive some sort of training on how to properly use them and they are not overwhelmed with learning too much too soon.

Hence, the explored effects that the auditors perceive on their profession, due to the implementation of digitalization technologies, are listed below:

- **Big data & analytics**
  Due to the use of big data & analytics, the interviewed auditors perceive that auditing tasks, for example, analysis on journal entries, benchmarking, and risks to discover issues and outliers are improved and eased.
- **AI & RPA**
  Even though the use of AI & RPA is not as pervasive as big data & analytics, AI & RPA help auditors to focus on more important and relevant tasks. As RPA reduces

human intervention, it removes human errors and improves reliability on automatically produced outcomes. For AI, bots can improve efficiency to assist auditors by asking questions about how to proceed with an audit that has been collapsed or uncertain control elements have arisen.

- **Blockchain**
  Although Blockchain is still in its infancy stage and it has not been adopted or used by auditing organizations and consequently by auditors as well, it could potentially contribute to making auditing easy and very accurate. By establishing a secured functioning blockchain use would have as a result that all transactions will be pre-audited and validated.

- **Competence/Upskilling**
  The development of digitalization has generated benefits for the auditors. The interviewed auditors perceive that digitalization has enhanced the skills and competence of auditors with the help of formal support, such as workshops and training from workplaces.

- **Improved Audit Quality**
  The auditors perceive that digitalization has enabled them to improve the audit quality by contributing to the smart analysis and continuous auditing. Subsequently, sampling of the whole population, quality of insights, products, relevance in analysis, fast and continuous production is supported by the digitalization process of auditing organizations.

- **Flexibility and Efficiency**
  Due to the digitalization, auditors perceive that their profession has become more flexible and efficient since auditors can still perform their jobs with less effort and time regardless of the location and place by means of remote-working opportunity and automation of repetitive tasks.

- **Auditing Reputation Growth**
  Thanks to the introduction of digitalization in auditing, computers, and technology enter the frame more prominently. Which by itself, makes the auditing profession more appealing as a career choice for younger people. Combined with the advancements it brings in terms of quality in audit, it makes the profession more respected by the general public and clients alike.

- **Increased Reliance**
  The auditors perceive that digitalization contributes to less risk and testing because automation reduces human intervention and errors. As a consequence, there exists an increased reliance on audit products and services developed with the involvement of digitalization technologies.

- **Reduction of Expectation Gap**
  The auditors consider that digitalization leads to the reduction of the gap that exists between what the public and clients think that auditors are able to do and what auditors are actually doing. According to their opinions, it gets progressively more feasible to perform audits on the whole data population instead of just sampling.

- **New Auditor Profile**
  Due to its constant advancing, the auditors perceive that digitalization imposes the changes in the requirements of the auditing profession. A new auditor profile requires modern skills and competences in more demanding fields, for example; being technology savvy or offering auditing services with more IT orientation.

- **Resistance to Change**
  The auditors perceive resistance to change as an important challenge towards adopting and adapting to digitalization. But auditors are divided when it comes to identifying whether changing will be harder to achieve for the newer or the older auditors.

In conclusion, the comparison of literature and empirical findings demonstrate that auditing companies are still in the initial phase of implementing all of the disruptive technologies. However, the interviewed auditors perceive that digitalization has actually led to more benefits than those proposed in the conceptual framework of this study.

6.2 Future research

As explained from the very beginning of this master thesis (see Chapter 1.1), digitalization is about a plethora of technologies that are being used for the purpose of creating new-value opportunities. In our study we focused solely on BD & analytics, blockchain, and AI & RPA. But there are plenty of other available technologies that could be examined separately or simultaneously such as: internet of things (IoT), 3D printing, augmented reality, and even drones, to name a few. Studying the effects of these specific technologies on their own or in combination poses of great interest for future research due to their recent emergence and timeliness.

Likewise, of great interest would be also to see the findings of similar studies expanding to Scandinavia, Europe as well as the rest of the developed world. Additionally, studies investigating the effects of digitalization on the underdeveloped world may be even more insightful as these regions are probably the least studied and could result in the extraction of valuable new data.

Appendix 1 Interview transcript – P1

Company: EY
Interviewee: Participant 1
Work title: Audit manager
Date and Time: April 1st 2020

Line	Transcript	Code
1 I:	Okay we are recording now. So, as we have said we are investigating the effects or impact of digitalization on auditing, that's the purpose of our research. Just letting you know.	
2 P:	Yeah, there we go (interviewee opens camera).	
3 I:	I would like to also mention that there are no right or wrong answers we are just gathering opinions. So, if you don't know something it's fine you just say you don't know (participant nods head in agreement). Everything will be anonymous, we are not gonna use your name or anything. If at any point, before we publish the study (interviewer smiles), you want to change an answer you can do it. Like if you remember something that you didn't say or you think you said something wrong you can change it, it's fine by us (participant nods head in agreement). So yes, do you have any questions for us before we begin with the questions?	
4 P:	No not really no. When is your thesis due, when are you submitting?	
5 I:	Around May.	
6 P:	So, there's been no delays? Although everything's happening (referring to COVID-19)?	
7 I:	Not from what we know yet (laughing).	
8 P:	Okay, okay yeah.	
9 I:	It all depends on the interviews if they do not delay.	
10 P:	Yeah, alright.	
11 I:	So, let's start with the interview. First of all, what are your working and educational background?	
12 P:	Okay so I've been at EY for five years, working as a manager here. My educational background; I went to Lund University, so I have a master of	

	Science and Business and Economics with an accounting degree. I had spent one semester in Singapore during my studies, so yeah that's pretty much my educational background.	
13 I:	What is your current work position and responsibilities within the organization, EY?	
14 P:	Okay so so yeah, I work as an audit manager here in Malmo. Our office is more of the larger offices like in Stockholm or London or New York they have different departments working exclusively with a certain number of clients or certain types of clients. I work with both smaller clients and also larger listed. Primarily my focus would be the United States audits so a lot of clients are either listed in the U.S. or where the parent companies are (interviewer says okay in low voice). For our office, I'm also the leader of a working group for data analytics or digital. So, it seems appropriate (interviewer says yeah) foar this discussion. So yeah and within that workgroup, we pretty much implement different digital tools and then also develop like practical guidance of how to do it or how to use it.	
15 I:	Okay and what is your relationship with computers and technology in general?	
16 P:	I mean I guess how you define the relationship; I mean it's key is essential I mean without the computer or without the technology I mean we wouldn't have this call and especially now being and working from home (interviewer tries to interrupt) I wouldn't have the opportunity to connect with my colleagues or teammates... (interviewer interrupts).	
17 I:	Sorry, the question is more about how technological, how to say, how technologically savvy you are how good you are with technology. Because you know some people only know how to open the PC and there are people that you know how to...	
18 P:	Okay yeah, I mean I would say I'm pretty good (interviewer nods) I mean I've always worked on it so I mean you get used to it and so that's very familiar to me.	
19 I:	Because you know it's kinda relevant with our questions because we expect different answers from people that are not very good with PCs and we expect that they will give different answers (participant smiles) for digitalization that's why we ask. Okay, so what do you know about digitalization, like how would you define it?	
20 P:	Yeah, I mean define it, it's basically taking it from paper to within your computer and then in terms of yeah I'm not really sure actually but (interviewer interrupts as the participant struggles to answer).	
21 I:	Or maybe you could name some technologies, like main technologies for you associated with digitalization within your field and outside of it any kind of technologies you can name that are key to you.	

22 P:	Yeah, I mean (participant trying to think) I mean all the Microsoft tools are key, we have a lot of audit tools that we shifted from papers to doing the audit within those tools. I mean the conversations we're having here with it with Microsoft teams and Skype is yeah also one that I use very often if that answers your question.	DT
23 I:	Yeah sure, so about big data and analytics (participant nods), are big data analytics something that is incorporated in your department in your auditing department?	
24 P:	Yeah, I mean definitely, we've had… if you go back like maybe five I mean if you go back ten years we didn't use it at all but if you go back five years it started to evolve and it started to arrive in our field and nowadays I mean now it's an essential cornerstone in our audit, we wouldn't be able to perform an audit of that quality but also efficiency without the big data tools that we are using. So, we use a range of different data tools all from looking at income statements to balance sheets to the planning and also in preparing communications with the clients. So yeah, I mean definitely a big part and I wouldn't be able to do my work without the analytics tools.	DT-BDA

PB-IAQ |
25 I:	So how often would you say they come in relevance in your weekly or daily routine?	
26 P:	Every day almost I mean almost every hour, it's like what we whenever we do some procedures or whenever we discuss with the client those tools for that data as the basis for those discussions.	
27 I:	Okay so you kinda answered in what aspects they help you do your job; can you mention any negative way it has affected your job or your field you think?	
28 P:	I wouldn't put it in a negative way but there's always an investment the first time you use it. So, whenever you're looking at at the data or wherever you're collecting the data it's always a matter of first you need to collect it and you in order to do that you need to know what to collect and then when you look at the data you need to know where to look. It's receiving all this data from the companies it's like finding a needle in a haystack. So you really need to know what to look for and how to use it and I think that's a transition where we started to become better in our field but I think there's still a long way to go in terms of fully utilizing it to a hundred percent. So negative I don't know but it's a yeah.	DT-BDA
29 I:	About blockchains, are blockchains something that it's incorporated in your field/department you know?	
30 P:	I mean if we talk about Big Data it's like that that we use every day. Blockchain is more of it's very limited at the moment there are coming we have a couple of tools like say maybe we have like hundreds of tools for big data, for blockchain we have only a few of them. So, it's just in the like	DT-BCH

		early days of implementation but we're getting there.	
31 I:		Why do you think that is, that you don't use blockchains so much?	
32 P:		I think the first transition as I said, as I said looking back a couple of years we didn't use any of these digital tools at all so I think the first transition was to incorporate big data and the analysis you get from the data is kind of similar to what you used to do before, so I think the next step is to further improve our analysis and our strategy to implement blockchain. And I think the educational background and working experience my colleagues and I have isn't, I mean I didn't study blockchain I never worked with blockchain before so it's it progresses we have to do. So, I think that's probably why. But I think as we are progressing and as we, I mean the change of digitalization gives us the opportunity to hire people with different kinds of backgrounds. Instead of only hiring accounting personnel we can also hire like yeah like IT or whatever and I think that change or that transition will further make the transition to the blockchain even better and apparent.	
33 I:		Can you mention some ways that you think blockchain could help you with your job to do your job basically?	
34 P:		I think this is a hard question to answer since I (interviewer says yeah) yeah haven't really had the experience with blockchain but from just reading it I think the trails that the blockchains are creating I think if we can use that within our audit I mean and put that into good use we can follow we can audit the company from I mean day-to-day basis. So instead of going out there a couple of weeks a year, we can like to follow them continuously throughout the year so maybe that's something that we will change.	DT-BCH
35 I:		Yeah and can you mention a scenario where you think using blockchains would negatively affect your job?	
36 P:		I think what's important whenever we talk about analytics or blockchain or digitalization is that we should not forget the purpose for what why we're doing it. So, I think that implementing all these tools and everything around it is absolutely key but we still have to remember what is the purpose behind it. So just implementing tools implementing blockchain whatever if it doesn't serve a purpose within the audit purpose I think that's something that can be it can be like you can be blown away of all these features but you have to still have to remember why it says why we do it.	
37 I:		Hmm okay. And about artificial intelligence and RPA. RPA is robotic process automation just to clarify. So, are those two technologies incorporated in your field?	
38 P:		Yeah I think especially the last couple of years looking back one two years we've started to use more and more AI, robotics that's still in very early phases but AI we've started to use for different checklists and like for when	DT-

	receiving confirmations of different things and so. So, we have a couple of tools not as many as for big data but still a few of them.	AI DT-RPA
39 I:	Okay and how often would you say they come of relevance in your weekly work routine?	
40 P:	I would say somewhere in between big data and blockchain. not as often as big data but still we see elements in audit.	
41 I:	Okay, and in what aspects do they help you do your job?	
42 P:	I think AI especially helps us focus on the right things so instead of doing repetitive tasks filling in the checklist we can instead focus on asking the right questions, look into what's important and what's really material for both the client and from an inspector perspective. So, I think that shift is it's very important. And I think AI really helps us there.	DT-AI DT-RPA PB-FE
43 I:	Okay anything about the RPA maybe?	
44 P:	Same thing there I think yeah us using RPA or robotics would again help us to identify where to look at getting all these tools getting all these data and then incorporating and having robotics creating different things can help us like put our time where it needs to be.	PB-FE
45 I:	And do you think they have affected your job negatively in any way?	
46 P:	Not really I think it's the transition we have to do whatever the cost but of course whenever you're initiating anything new it's always the complexity and how to do it and so on that has been in first-time investments I think both from my personal time aspect and from the firm as well.	DT-AI DT-RPA PC-RC
47 I:	Okay and how familiar and confident do you feel using those technologies I mean all the previous ones not only AI and RPA.	
48 P:	Blockchain maybe not so much, AI more than blockchain and big data I mean definitely very comfortable.	
49 I:	Okay did you receive any prior training comes how to use them from your former education or in your workplace?	
50 P:	My educational background at Lund we didn't I mean we may be mentioned it but in terms of training nothing. Starting at my firm here we re-	

	ceive all different kinds of training as I mentioned before when we started at home the working group that I lead we were running different workshops having emails create like training materials and whatever so yeah, a lot of training and time goes into that.	PB-CU
51 I:	Yeah, did you try to let's say familiarize yourself by yourself?	
52 P:	In some way, yes but still given the time constraints that we're facing and so on, I think you need to push that training or that experience into really look at it.	
53 I:	Can you tell us some ways you actually let's say trained yourself a bit you know like YouTube videos or something?	
54 P:	(laughs) Yeah I think that's a good idea, I mean a good example, YouTube sure. I think most of our tools are firm-specific so if I go to different firm you wouldn't see the same tools, there will be elements of of the same thing but it's a different usage and a different way to do it I think we received different like training data cubes that we can play around in but in terms of finding it outside the firm yeah.	PB-CU
55 I:	Okay, and how would you react if we let's say your company informed you that you have to start using all those technologies more, more incorporated in your job you know.	
56 P:	We actually already have that kind of requirement (interviewer says "oh"). So yeah I mean I think that's a something you need to do in order for keep evolving I mean whenever we're stopped whenever we stop evolving as a profession I think that's where the problems this is going to arrive and so I think that's what we need to do. So, we already have that requirement and I know going forward even like stricter requirements in terms of you you have to use this try this and some will implement it. So personally, I would say it's the right thing to do definitely.	PB-CU
57 I:	Did you receive any kind of training regarding the blockchain or artificial intelligence or like anything besides big data analytics.	
58 P:	I think for for blockchain it's it's still in the very early stages I think where we are currently is more of trying to see where we can use it and trying to see okay what would the benefits be so in terms of training there it's more of like shorter information slides or information videos but we haven't like really or I haven't personally really like tried it out.	
59 I:	Okay you kinda let's say answered it a bit but what are your feelings towards digitalization in your profession?	
60 P:	Yeah I think it's essential I mean it's something that we just have to do both from a client perspective and from a quality perspective. I remember a training we had when we were first introduced the facilitator told us that imagine auditing a company like Siemens like you have millions of trans-	

	actions and the way we used to do it is that we sampled a couple of transaction looking at maybe like let's say we looked at hundreds of transactions out of 10 million. So, by incorporating digitalization we can instead look at the entire population so instead of looking like only on a fraction we can look at the entire thing. So, it gives us both client insights clients, perspective, quality, efficiency I mean it's absolutely key.	PB-IAQ
61 I:	Would you say or do you think that digitalization has added quality in auditing? (participant says "yeah yeah definitely" immediately). (interviewer smilesfre) And if yes how?	
62 P:	Ehh as I just mentioned we moved from a traditional way of sampling and looking at certain transaction. Now we look at the entire population and look at what is outside of our expectation so we're finding the unusual transaction in a much easier or a much more efficient way. So yeah definitely.	PB-IAQ
63 I:	Okay do you think digitalization has reduced the number of repetitive or let's say boring tasks in auditing?	
64 P:	I think yeah I think so to a certain extent. As I mentioned there's an investment that has to be made the first time you implement it and when you implement it on several different clients it's like that could become a bit repetitive but going forward a year to year from three and then forward is as you definitely remove most of the repetitive tasks.	PB-FE
65 I:	Okay and how do you envision digitalization's future on your field like what changes will it bring you think?	
66 P:	Oh yeah that's a great question if I knew the answer to that one that would be awesome (participant smiles) but I think as mentioned it's absolutely key and we've seen a lot of involvement the last couple of years. And I think the next five years or the next I mean two-three years we'll see even more so yeah I mean it's an exciting question or exciting thing to think about because looking forward in ten years I mean that transition we've made so far it has been so rapidly so looking forward ten years I can't even imagine what's gonna be like but it's I think we're going the right way. In terms of the effect on us and it's moved the focus to two different people and the level of competence or the level of skills, you need to look at the different things in order to find those unusual transactions the level of competence and the skills have increased. So, I think we will see an increase in that going forward also.	PB-CU
67 I:	Do you think that the level of competence increased? Do you think it's an advantage or a disadvantage for you as an auditor?	
68 P:	Ehm (participants thinks a bit) I mean it's an advantage in terms of when looking at the profession and I think that at least here in Sweden, there used to be a boring reputation, the profession used to had a boring reputation and I think as we move towards different ways of auditing we're	PB-

	changing that perspective and that reputation. That is a huge advantage in terms of attracting talents, attracting clients and also for us to develop as a person.	CU PB-ARG
69 I:	Also do you think the reputation has also enhanced the reputation of the auditing profession in general by the help of digitalization? Because people previously looked at it as a boring job more like you know more complex and now it's more appealing, less boring. Do you think in this way?	
70 P:	Can you repeat the last sentence again?	
71 I:	I mean like do you think digitalization made your job more appealing and increased its reputation.	
72 P:	Yeah definitely definitely.	PB-ARG
73 I:	And do you think digitalization is going to be more prevalent in the future more present? In auditing of course.	
74 P:	Yeah yeah absolutely and that's I mean at least that's what I'm seeing and the transitions we're currently making. I mean it all results in the more digital audit.	
75 I:	And do you think digitization is going to have any impact on how many auditors need to be employed basically in the field? (participant hmms) Basically, will the number increase, reduce, stay the same you know?	
76 P:	Ehm also a great question and I kind of get the feeling of where you coming from but I would say it would probably remain the same case. I mean the profession is growing but again the use of data in a way that makes us more efficient would be I wouldn't say reducing the number of people working in the profession but more of working with different things so instead of spending our time on trying finding different things we can now spend the same amount of time and the same number of people asking these all questions that are really important for the auditor . I don't think, my personal opinion would be that we won't see a decrease. Potentially could actually lead to an increase because as we just discussed the reputation and so on increase and I think it's getting more attractive to become an auditor.	PC-NAP PB-ARG
77 I:	Okay and how satisfied are you personally by digitalization impact on auditing? You can be dissatisfied as well.	
78 P:	Yeah no but I mean I'm very satisfied. I think we can do a lot more I think that that's where we struggling now I mean I've only been in the profession for five years there's there are people or colleagues of mine that's been here for 25 years, 30 years and those people are. I wouldn't say hesitant but in that direction to digitalization. So, I think as we evolve going forward, they	PC-RC

	get more familiar with it so yeah.	
79 I:	What would you say are the benefits, opportunities, and risks that digitalization brings to auditing?	
80 P:	I think I think it goes back to what I said before that efficiency, quality, client insights; I mean those are all benefits. The risks are that also this kind of you you need to be able to find the needle in the haystack you need to have that level of competence to know where to look and I think it's always like like I say to my junior colleagues whenever they sign off of anything and they say okay all looks good, so I always tell them, okay but if you look at the company there are 1 million 10 million transactions is it really reasonable that everything looks good? If you would have done or prepared 10 million transactions would you have made everything correctly? If so you'll probably be the best accountant in the world (participant smiles) but so I think that's the risk of implementing all this that it gives us these great looking spreadsheets and great looking graphs and just looking at it says okay yeah it looks good but you need really need to understand where to look at that and what to look for.	PC-NAP
81 I:	And do you think it's harder or easier to be an auditor now than in the past?	
82 P:	I think it's the opposite way. I think it's it was a lot easier before. (interviewer mhmms). Because looking at an invoice tying that out to a number that isn't that that's not hard. Looking at a graph looking at different kinds of tables and see or identify where should I look now what questions should I ask that makes it a lot harder. Then again you have all these tools that enable us to do it and that aspect of it makes it a lot easier so I guess it's the combination of it depending on how you would define it .	PC-NAP
83 I:	Okay and do you think the skills or the requirement to be an audit are going to change in the future ?	
84 P:	Yeah yeah definitely I think I think I also said that before that we're seeing a shift from just accounting personnel to other individuals and other competencies and I think going forward with that shift will be even more prevalent.	PC-NAP
85 I:	Okay I don't think we have any other question about digitalization basically. We are on time I guess; do you think there is anything we have not brought up and you would like to mention?	
86 P:	Maybe no no not really no. Yeah, I mean whenever, I mean I guess once you look into the recording and so on you just feel free to reach out if you have any questions or want me to clarify anything or something.	
87 I:	(interviewer laughs) That is good because that was basically the next question, I would ask you now. Okay would you like to receive a copy of the study once it has been published?	

88 P:	Yeah that would be very good. Okay and is there anything you would like to ask us? Yeah, I guess so what would your view be on on on this topic and and on auditing in general?	
	(short conversation ensues but is not of relevance to the study)	
89 I:	And I the interview ends here if you don't have anything to add.	
90 P:	Yeah thank you very much looking forward to reading your conclusion and so on.	
91 I:	Thank you very much for your participation was a very good interview and thank you for your time.	
92 P:	Take care bye.	
93 I:	See you thank you.	

Appendix 2 Interview transcript – P2

Company: KPMG
Interviewee: Participant 2
Work title: Auditor/Head of development
Date and Time: April 3rd 2020

Line	Transcript	Code
1 I:	You can start recording now if you do not mind.	
2 P:	Yeah, now its starting.	
3 I:	Okay perfect. So, first of all, the purpose of this study is to investigate the effects of digitalization on auditing. We investigate the benefits and challenges and ehh also, I would like to assure you that there are not any wrong or right answers. We are just only gathering opinion-opinions and views of auditors about digitalization on auditing. And also, all your answers will be anonymous so we are not gonna use your name or anything. (participant hmms) So you can give your honest opinion.	
4 P:	Approved and I also have some rules that I really want to read what you are printing (interviewer hmms) before you publish. So, I can at least see that these anonyms are okay and so. And then, of course, I normally also have the whole thesis when that is ready of course.	
5 I:	Yeah, we can send you and also, we also give you the option if you want to modify anything you say either now or later until we publish, of course, you can do that, we have no problem. If you want to add something or change something, an answer.	
6 P:	Yeap.	
7 I:	And also, probably, to let you know that, ahh we won't use names but we might use things like ehh 5 guys from KPMG and 4 from Deloitte said these, these our findings. Okay?	
8 P:	Hmms in agreement.	
9 I:	That's as far as we will go. But no names that is all. Okay. Do you have any other questions you want to ask before we begin?	
10 P:	No, you can.	

11 I:	Okay perfect so.	
12 P:	I do a lot of these so...	
13 I:	Oh nice.	
14 P:	I am prepared.	
15 I:	Nice. Ehh first of all, what is your working and educational background?	
16 P:	Ehh I am a "civilekonom" (translation: civil economist) ehh so university studies, I am an old guy so might when I did it it was three and a half years the university. And then I have been a professional auditor for 20 years and after that I worked at our head office in the US for 6 years with methodology and tools development and nowadays, I am head of development for the small-medium enterprise market.	
17 I:	Okay, if I may ask, are you older than 55?	
18 P:	Yes.	
19 I:	Okay it might be relevant later in our study we don't know but just wanted to make sure. Okay, so what is your current work position and responsibilities within the organization?	
20 P:	Yeah so the head of development, I am responsible for all our tools and development and so on. So, currently as of now we have a completely new audit tool up in the cloud and we have a completely new customer portal also up in the cloud, in Microsoft Azure environment. And ah yeah, we work with machine learning, logarithms and we have started a little bit yeah AI, robots and so on and yeah all these are under my wings or whatever.	
21 I:	So, what would you say is your relationship with computers and technology? Your personal relationship.	
22 P:	Ehh I was starting working in 1991, 1996 I got mission to move from the Apple to the PC world. And then I declared that I will do this for 3 years then younger guys and girls will take over, and that hasn't yet so yeah. I like computers and so on but I am not a programmer. I am a really good at drawing the business rules, user stories, making tasks and this type of things. And also, during all this year I work with this and also development skills to talk to programmers. Because normally they don't understand what they are doing especially in our business: accounting, auditing and advising. Because they don't know, they haven't worked there. So that is my benefit, that I have both sides and then that has helped me a lot.	
23 I:	So, you know your way around computers.	
24 P:	Yes.	

25 I:	Okay, that is good. And what do you know about digitalization like how would you describe or define it?	
26 P:	Oh, that's a big question, digitalization. (interviewer hmms) Ehh so hmm it's I think different people talk about digitalization in a different way. Normally you think that it was taking away the paper and be digital. But for me, it's not. It's more to use the new way to change the way we have worked before. So, for me, it's much more to use the new technique that we have in the cloud with the automatization, standardization yeah, all the innovation that we have that we can use, and so on. And look for the future, how will, for example, audit be performed in 5 years or whatever.	DT
27 I:	Okay, could you name some technologies associated with digitalization? Either in your field or outside of it.	
28 P:	Depends what you mean with that. But Microsoft Azure and the cloud app service, data warehouse, data lake ehh different programs ehh skills like Python, using very sophisticated project tools like Microsoft DevOps. That you follow everything in a way that you never have been able to do before and so on, could be some example.	DT
29 I:	Okay yeah, it's good enough. We are just checking how familiar you are with digitalization that's all. Now in more, let's say, main questions. About big data and analytics.	
30 P:	Yeap.	
31 I:	Are big data and analytics something that is used or in cooperated in your auditing department?	
32 P:	Yeah, yes and no. Because ehmm it's very important to know that we need to have access to our client's information. But that access is only for the audit purpose. So ehh a company like KPMG will never ever sell any information or use any information from client X to tell client A what that client should do and so on. But of course, we work with the big data and the information in another way that we now do patterns and can tell the company in much other easier way that took hours and hours to do before. Now when we are almost in every engagement upload for this new audit tool, we take three years of data. (interviewer hmms) If we don't have it already, we uploaded that to make it possible to see different things like patterns and other things that are coming up and compare them. We also using, yeah, "Sylonis-es?" is one example that is a process mapping tool that you can follow different movements in the client. Our things are starting with the order and then the order of the products and then the products will be delivered or go to the store and then further out in the organization and so on. Ehh so yes, in that way we are using it a lot. But you have other types of companies that are not in our industry they using these big data for other purposes that we can't do that and will not do that.	DT-BDA

33 I:	It's okay, we are not investigating this, so it's fine. How often would you say it comes of relevance in your weekly work routine? Like big data and analytics.	
34 P:	Oh, I work with that every day.	
35 I:	Every day.	
36 P:	Yes.	
37 I:	Okay. Could you say, could you mention some aspects that they help you do your job? Personally.	
38 P:	Yeah, for example, we have been very structured. So, we have a common data platform that we haven't had before but now every, yeah, every transaction that is happening in a company ehh before it was like can't be or we did it in one way there and another way there and so on. Now we put in all the data in various structured and standardized ways. So, then it will be much easier to compare and see these patterns between years and all that stuff. So, that's a big difference and that is the whole company. It does not matter which department and office you work with. We have yeah standardized central process for taking care of the data .	PB-IAQ
39 I:	Okay, could you think of a way that big data and analytics have affected your job in a negative way?	
40 P:	Negative way.	
41 I:	Yes, any disadvantages to say. For you.	
42 P:	Yeah, I think for me or auditors I think you know a normal audit is in a way that you do sampling. (interviewer hmms) That is depending on what materiality, figures are setting on the company. And normally we figure that picture that you say that you are standing with a waterfall and normal audit is that you run in the waterfall with a big, what is called, yeah when you gather water in something, take something, that is a sample or something. And sometimes you have a structure with calculated sampling, that you can be sure that you have taken enough water from the waterfall to be sure you can say something on the data. But with big data, we put a funnel on the waterfall. (interviewer hmms) So all the water that is coming down from the 1st of January to end of September is going into our data warehouse. And of course, when you start working with that (participant phone rings) -sorry- ehm start working with that, you get so much information. So actually, we can see things that we thought ohh this company we haven't found anything in a normal audit. But now we have the full population. And when the logarithms and machine learning and my robot (participant slightly laughs) it's not 100% trained you can have the greens that okay that help us, you have the reds that is wrong we need to look at that.But currently, we have a little too much in this orange box that the system can't say if its right or wrong. So ehh that can scary us some times. Because ohh to go through that box could	

	cost a lot and then of course the signing partner or the auditor it's worried "Could I have missed something here, how should I?". Here I think the whole industry is learning how to minimize these outliers, that we call it, to be less. Because if we get too many outliers through this new way to audit with a full population then of course then one solution could be that we get more money from the client. But of course, you know this could be already decided many years ago that we have a contract one of our clients and yeah we have a maximum fee that we have said that we should charge them. So, it's not so easy to suddenly charge much much more. So that could be a scary thing that I think here we are working with it but could be scary some-times that you find more and this also related to the quality of the underlying data. If we have a company that has really good routines, internal control, and so on. Then of course, the outliers will be less (interviewer hmms) and if we have a company that has some security or ehh it's not so hard on the in-ternal control and the routine of process. Outliers will be more of course. So that could be a little scary and we need to find ways to control that.	PB-CU
43 I:	Okay, that's good. Moving on to blockchains. Are blockchains in cooperated in your department? In auditing.	
44 P:	Ehh nope.	DT-BCH
45 I:	Why not?	
46 P:	We haven't found any good way, yet. I have been looking in different way like the "Lantmäteriet" (translation: the Swedish national land survey), here in Sweden, have done it. And I have looked at some banks that have tried to in cooperate it but of course it could be good that we could be one of the points in a blockchains that guarantees that "this is correct" or something. But hmm yeah, the best case or the case that we have said we should go for it hasn't been there yet. At least in my department.	DT-BCH
47 I:	Hmm, do you think or can you mention a way that you think actually block-chain would help you with your job? In auditing, basically.	
48 P:	Yes of course. If you have secure blockchain, then the auditing should be much easier about that. Because if that working, it should be yeah everything should be correct then (participant slightly laughs). If that could be true but yeah again haven't seen that yet. But…	DT-BCH
49 I:	Okay and can you think of a scenario where their implementation would negatively affect the job?	
50 P:	With blockchains or?	
51 I:	Yes, yes blockchain.	
52 P:	Oh yeah, you can have big risk if we are in a "prodit" with a blockchain and it's the KPMG name that secured that this will be a blockchain that you can trust 100% on, then it's something that fails that will of course not be good	

	at all.	
53 I:	Okay, so moving to artificial intelligence and robotic process automation, RPA. Are those something that are of use in your auditing department?	
54 P:	RPA we are using but that's to speed up different processes instead of that a person, physical person, preparing or moving things. For example, we have a lot of clients that put things up in a portal, and then we have RPA and goes and fetch these things and put them in the right place in our system. But that's yeah more easy things we have done.	PB-FE DT-RPA
55 I:	That's for RPA, do you do anything with AI?	
56 P:	Ehh probably we do something but it's in the beginning that we are testing different types. It's nothing that is, I think that everybody is lying on that (participant and interviewer laugh a bit) but ehh we don't have anything that is out in production.	
57 I:	Okay, how often would you say RPAs come into play like in a weekly work routine? For you or your department.	
58 P:	We have that every day because we always speak with 25.000 clients it's always some clients that have something that we should pick up and so on. But it's moving files from A to another place, that's what we are doing. Then, of course, we have our advisory team, they have a lot of specialists that help different companies to yeah look of the different processes that could be used by RPA and if then they decide to do that, we can help them to set that up and so on. So, we have some big cases that we have done during the last years. But internally in our company, we haven't used it so much, yet.	
59 I:	Are there any negative ways that they have affected your job?	
60 P:	With those things?	
61 I:	Yes, RPA, and AI.	
62 P:	Not what from what I have seen yet. But AI, because we are not in production, it takes time to train. (interviewer hmms) You know it's not like theory or yeah or Google home or whatever they are called that "I want to buy flower, please give me a telephone number to the nearest flower shops" in auditing it's much more yeah the logarithms around it are a little bit more advanced. So, it is much more machine learning things that we use to repeat things, and yeah using logarithms and all that stuff that's easier to build things about. The AI is a little bit that you need to train the robot very well before we can use it.	DT-AI
63 I:	So, in what ways you think they help you do your job then? Mainly RPA be-	

	cause AI you said you don't use so much.	
64 P:	But yeah AI, I think it could be really useful. Because of course in audit, you will end up in a lot of situations that yeah you need to think, you need to have yeah take a minute or more minutes to think about the situation "what can I do". And if you have a robot that can go in and help you with different thinking, whether you can talk to the robot or the robot can show you quickly that "okay you are here in this situation, I can show you some scrum example of what your colleagues did 2 days ago in the same area". That could help a lot of course, if you could build that app a little bit.	DT-AI DT-RPA
65 I:	Okay and how familiar and confident do you feel using all the technologies we mentioned? Like starting from big data and analytics, blockchains to AI, and RPA.	
66 P:	Big data and analytics we are pretty good on that. Ehh and have rules and rights and all that in place so that is no problem. Blockchains, I am not there so I am not…(interviewer hmms) yeah, that is something that if we end up there I need to train my self a little bit more. As I have said. I have been looking to see if I could go home with an "oh this we could do" directly but it has always been other thingsthat have been easier or yeah less cost full or quicker to do and to start a project with blockchains.	
67 I:	What about AI and RPA?	
68 P:	It will not be me; I have other experts that will help me to do that. So, in that case if it's on me, not comfortable but together with my experts I think we can manage to do a lot of things during the next 1-2-3 years.	
69 I:	Hmm okay. Did you receive any prior training on how to use those technologies from your former education or your workplace?	
70 P:	Ehh no, when I went to university it's almost when the calculator was (participant laughs). You didn't have a phone, an iPhone at those times. Ehh so…	
71 I:	So, they were non-existent back then basically.	
72 P:	No no, everything is learned by yeah being in it and work with it, and then, of course, I have a team around me that have newer education and so on, that I can ask and they learn me. So, I learn new things every day, in my work. Because I need to listen to a lot but my role is to make a decision and also yeah have a plan that things happen. Because you can't be ahead of development and you do development, development but no release. Or you do release that no one understands what they should do with it and so on. So, I am more in the focus that I build from the ground. So, I need a foundation and then I need a first floor, a second floor, the third floor and so I am on a journey that I am building a high rise building and then I take in different part and components when I have yeah the skills and the foundations that I need to have before I am doing it. I can see so many projects that they aim for the	

	most advanced things and so on and then they continue to work and work and then yeah they think "oh it's so easy to scale down" but my feeling is to scale up.	PB-CU
73 I:	Hmm, okay. Ehh did you try to familiarize yourself with those technologies by yourself? Because you made a mention of a team of experts and staff.	
74 P:	Yeah so, of course, I sit behind the expert. We, for example, this weekend that will come we will be at a big hackathon that will be during this week-end. That a lot of company around Sweden is doing a hackathon on the Coronavirus. And I don't know it was extremely big teams that will be in this competition and the end goal is to find something that can help us in this situation that we are now. So there the team we have from KPMG will use AI and another type of technique and so on and try to do something. It's a presentation of over two minutes of video production and then it's a jury that will see if something of this is realistic or not. So, of course, that type of event is then you get a lot of insights, things we at KPMG also have an alliance with Microsoft so we have a lot of meetings with them and they train us, tell us, benchmark us with different things to think how to use a different type of techniques that are out there.	PB-CU
75 I:	I see. And how would you react if it was announced that you needed to start working a lot more with these technologies?	
76 P:	Haha yes, gimme the money no problem!	PB-CU
77 I:	(interviewer laughs) Okay.	
78 P:	Because you know everybody is not there so its always a question of re-sources and money, of course.	
79 I:	But you are not, how to say, scared or against it basically?	
80 P:	No, I think we will not survive if we don't, then of course again, blockchain might be something that I will not go into. But you need to be open minded and see what I think again if you look this time if you had to ask a lot of my colleagues 3 years, 4 years if it was possible to work from home during three weeks and never been at the office they said "no no it's not working, can't do that" (participant laughs). And it's working nice, I think its boring but it's you know the technique here, teams, skype, different things are up and run-ning and even then, is everybody is sitting there and working from home, almost. So that is little bit amazing.	
81 I:	I see, and what are your feelings towards digitalization? In the auditing pro-fession?	
82 P:	Feelings. Yeah, you need to work with it and I think for me it's also that I don't think we can work as we have done because the year 2019 it's a lot of	

	companies that still haven't got audit reports, yet. The smaller one is coming now in April-May and June, which is a long year after the year has been finished. And this corona gives you a really good example about that yeah will that help the banks if the client will go with a 2019 year's financial reporting? Probably not. Because banks are or the financial parties outside there want to know how is the client feeling now, how is the status now? So, we need to be more in real-time instead of looking yeah back in time.	
83 I:	Okay, are there any specific parts of the profession that you think are most affected by digitalization?	
84 P:	(Inaudible part) Accounting services are the first that will be already coming big changes in how you are working. For example, you can take one example is that if you have a different receipt that you want the company should pay you for yeah renting the hotel or paying some dinner or paying some flight tickets or whatever. Everything was in the paper and you were filling in some excel sheet or paper again and you were sending it in and it took forever. Now a lot of people are going with a phone, take a picture and the system is doing correctly with VAT, which cost this is, if it's a taxi or if it's a flight ticket or what it is. And yeah you can send it in in 1 or 2 minutes and then your money is in the bank 2-3 days later. So yeah. And of course, that is also a lot of people have disappeared because now we don't need so many people to look at it because it's controlled and it will be so its more looking at the system that doing this, is that working? Then the other things should be okay. So, it's a lot of things that happen to account services and as I said for an auditor we need to go more in real-time audit and we have done before.	PC-NAP
85 I:	Okay and do you think digitalization has added quality in the auditing process?	
86 P:	Absolutely!	
87 I:	Hmm why? In what ways or in which cases?	
88 P:	It could be wrong to say that digitalization has added it. It is more than now when we have the opportunity to standardize, automate, and work with a lot of logarithms and so on. More things went right directly and it's a little bit more than the standard that we have with high quality in the company.We can control it a little bit more from yeah central hole way instead of depending on each auditor that are following the rules. Now it's like yeah in the tool, you need to follow the rules. When it was paper and a pen or excel sheets or whatever, if an employee wanted to do in another way they could do that and yeah it could take a while before we were realizing that here we have someone that does it in a little bit different way. (interviewer okay) So the quality will be much higher.	PB-IAQ PB-FE

89 I:	Okay and do you think digitalization has reduced the number of repetitive tasks or boring tasks, to say?	
90 P:	Yes. Of course.	
91 I:	In which ways or in which cases?	
92 P:	Yeah we can match, ehh I don't know if you know one that is an auditor but it's a lot of work that you walk to looking for a paper, finding a paper, walking to the copier, scan that, put that in, put reference in, read and see. Lot of these tasks we can do with the automatic procedures and so on. So, the less qualified work that was needed to do is actually done by the tools nowadays.	PB-FE
93 I:	Okay and how do you envision digitalization's future on your field? Like what changes will it bring, you think?	
94 P:	Oh, if I knew what exactly it will happen, I should not be sitting here I think I should have –	
95 I:	(interviewer laughs) Just a guess, like a feeling so to say.	
96 P:	(participant laughs) no, but it will be a lot this is again we will go more to real-time audit and we will have much more things already prepared and done. We will have much more third-party information that could be today you can google around Sweden but when with this tool and using everything we can have it as a KPMG and bring it into the audits that we want. Because we know which industry, which town this company are in and so on. We can help the audit team so much more with all this information we have outside our world. But are available when you search for it.	PB-IAQ
97 I:	So, you think it's going to be more prevalent than it is now, right?	
98 P:	Yeah.	
99 I:	Okay and what do you think digitalization's impact on the number of auditors required to be employed will be?	
100 P:	For doing the audit, we will need fewer people. But when you do it when you now go for full population and so on, we find so many things that give customer value, bring more insight to the customers and that gives opportunities to do other works.And help clients with these other works. That can be tax-related, it can be set up internal control processing systems, it can be answer and questions, a lot of items coming up, and so on. So overall, I think we will, the revenue will not be less. And I don't think the employees will be less either but the title "auditor" might be lore.	PB-IAQ PC-NAP

101 I:	And what do you think is the impact of digitalization right now in employment rates? Has it affected it?	
102 P:	Its two things here, the university has also changed the way how you should educate you to be an auditor. We don't need it, this will be a problem for the industry but normally we hire hundreds of students and then we train them for 5 years with a lot of skills. Reading, financial reporting, understanding cash load because normally they don't understand so much when they are coming from the university. Practical at least. But when we now reduce these things that you can do the first years, of course, we don't need so many. But we also have started (inaudible part) and that is a place that we hire students that are still in the university and then we train them with different things and then they can go directly into the organization but little higher up. So, I think that is the way we will interact with the students earlier, not when they are finished, already when they are starting the university and according to that they will learn a lot of things, practical things that they need to do and then they will be ready to jump up a little bit when they are done with the university studies.	PB-CU
103 I:	Okay so you think the number of auditors will not be affected by digitalization?	
104 P:	No, I am pretty sure that we will have other things. Because auditor is good skills you have a lot of experience from different industries, you are analytics, you like figures, you like to talk to a lot of people because we have a lot and many clients and so on. So, I think we will do other things, that are more advisory things instead of auditing time. So, I think we need more people instead of fewer people but they will do a little bit differently. For example, at KPMG now, I am, as you understand, I am almost worked 30 years (participant laughs) don't tell anyone because 30 years in the same company is something that you young guys said that you are stupid. You should change every year (participant laughs) but yeap, since 1-1.5 years ago we started employ like technical guys, data engineers, data skills of different things, and so on. That has never happened before. So, I think we will have other types of skills and together we will be a really strong company.	PCH-NAP
105 I:	Okay and how satisfied are you personally by digitalization's impact on auditing? And why.	
106 P:	Oh, I am saying that I have the most modern tool ever here now in the Nordics, in the two things that I have gone to production now this 2020. So, I am really satisfied.	
107 I:	Okay and what are the benefits or opportunities and risks that you think digitalization brings on auditing?	
108 P:	I think it's a lot of benefits but it's a long journey also. Because we can be good at this but also our clients need to change because if they are still using paper or not new techniques. Then the things that I am putting into the mar-	

	ket will use less or worse if it's a paper-based audit and so on. So, we also have a way to work with our clients to digitalize them also. To use to have an ERP system in the cloud, using/scanning the pebbles and trade receivers and all that stuff, receipts, and all that. It is a long journey.	DT
109 I:	Okay and do you think its harder or easier to be an auditor now than in the past and why?	
110 P:	(participant laughs) Today, with the corona, it's really hard to be an auditor because now it's a situation that you have never maybe the older auditors have been in one crisis or two but this crisis is completely different than what we have seen before. Of course, if you are older you might think that it goes to snap fast with the new technique and digitalization and so on. They want to read, to have a paper in the hand and so on, so it could be some things there. It's a big journey of change and overall people we don't like to change so much (interviewer hmms) so there we also need to work with all our employees so they see the benefits of all these. But overall, it's many more laws, rules, and demands on an auditor today. And as you know if something happened the press or mass media, they don't ask the owner, they try to ask the owner but suddenly they are standing outside the door of the auditor and "why didn't you see this? Why did you sign the audit report? Why? Why? Why?". So I think it's a lot of things that have been much harder to be an auditor than it was 20 years ago.	PCH-NAP
111 I:	And do you think that the skills or the requirements are going to change in the future?	
112 P:	Yes, I think you need to be much more open and absolutely understand. Because the company's IT system will be much bigger and sophisticated also. Of course, the skills and I think today in bigger audits the auditor is never alone, you have IT people, you have tax people, you have legal people, you have different types of skill with you. Because it's so complicated already today.	PCH-NAP
113 I:	I see okay. Ehh this is it for the main questions.	
114 P:	Hmm.	
115 I:	Thank you for the interview and is there anything we have not brought up and that you would like to mention?	
116 P:	Ehh not what I can recall for the moment.	
117 I:	Hmm. Okay also will it be alright with you if we contacted you in case a new information or a clarification is needed?	
118 P:	Absolutely.	
119 I:	You already said that you would like to see the study.	

120 P:	Yeap.	
121 I:	Is there anything else that you would like to ask us?	
122 P:	Not for the moment no. I think I will send the recording (participant was the one recording the interview) and then we go for that and yeah please feel free to contact if you want to ask or follow up some of my answers.	
123 I:	Okay you have our email, (participant yeap) we have your email. Just remember to send us the recording as soon as you can.	
124 P:	Yeap, I will try to do that now directly otherwise you never know (participant laughs).	
125 I:	(interviewer laughs) Yeah, we will remind you for sure this is pretty important. Ehh and thank you for your interview, it was very insightful and I think we were on time.	
126 P:	Hmm thank you very much! And again, sorry for being late but-	
127 I:	It's fine.	
128 P:	Yeah, good thank you.	
129 I:	Thank you and see you!	

Appendix 3 Interview transcript – P3

Company: Deloitte
Interviewee: Participant 3
Work title: Audit assistant
Date and Time: April 8th 2020

Line	Transcript	Code
1 I:	First of all as we have already stated our thesis is about investigating the effects of digitalization on auditing. The study particularly investigates the benefits and challenges of digitalization for this position. I would like to assure you that there are no right or wrong answers, we are only after honest opinions. Also, your participation is anonymous we are not going to use your name at any point in the interview we will just mention company names like five guys from Deloitte, five guys from KPMG, and here are our findings.	
2 P:	Okay, that is fine.	
3 I:	You also will have the capability or the ability to revise the transcript and to modify any of your answers at any point. If you feel like you forgot something or something you stated you want to check. Do you have any questions before we start the interview?	
4 P:	Not so far.	
5 I:	If you have you can ask later	
6 P:	Yes, sure.	
7 I:	So first of all what is your working and educational background?	
8 P:	So my educational background is that I have a one-year master's from Lund University in accounting and finance and right now I'm working as an audit assistant at Deloitte.	
9 I:	Okay. Could you tell us a bit more about your work position right now and your responsibilities?	
10 P:	So, I am what they call an experienced assistant which basically means that I have some responsibilities over the younger colleagues and I'm responsible over my own work and also reviewing others. So, overall just audit work.	

11 I:	Okay. How would you describe your relationship with computers and technology in general?	
12 P:	I would say they are good. I mean I've grown up around computers I've used up my whole life and I find that they are a very useful tool.	
13 I:	What do you know about digitalization like how would you define it.	
14 P:	I would say it's about moving things to the digital form like going from pen and paper to using computers instead and all other changes that come with it yeah.	
15 I:	Could you name some technologies associated with digitalization either in your field or outside of it.	
16 P:	I mean it's hard because there are so many but I mean the Internet and just how we communicate with each other. Everything is online these days I mean we don't receive any papers or anything from our clients. Everything we do is online such as uploading and sharing files and we work in a specific system that we can archive the things we have done. and yeah so	DT
17 I:	Let's move into big data and analytics. Are big data and analytics something that is used in your department in auditing.	
18 P:	Yes, absolutely.	
19 I:	How are they of use?	
20 P:	Well we have a specific analytics team mm-hmm with some people that sort of have that in focus and we actually use them most at the beginning of each audit assignment. So we use them for risk analysis and we take a look at if there are outliers. Then we can focus our audit on those specific areas where we identify the risk. Additionally, it's a tool that we use it later, for example, revenue testing we also use analytics. therefore, its usage is growing every day.	DT-BDA
21 I:	Okay. Are big data analytics something that you personally make use in your work routine.	
22 P:	Yes, absolutely. I'm just going to take an example. Let's say for accounts receivable, so before we might have used like random samples or something like that to test and see if we can accept it but now we can instead use analytics. For example like PowerBI where we can look specifically at different areas like regions and late payments and stuff like that. And if we find out many late payments, then we can go back and take samples from that specific one instead of choosing random samples. So, that is one example of how we use it.	DT-BDA

23 I:	How often would you say that you make this use like in your weekly work routine.	
24 P:	I mean I would say I use it in some like every week, probably. In some way, we do some form of analytics. I mean it can even be very simple in tools like Excel.	
25 I:	Could you say some aspects that those two technologies help you do your job well.	
26 P:	I mean they really make us focus on what is relevant and we capture outliers much better. Also, we can use specific sampling instead of random.	PB-IAQ
27 I:	Do you think they have affected to you your job in any negative way or well maybe they can bring you some challenges?	
28 P:	I mean when using new tools there is always like a learning process. It takes some time before you learn how to use them properly and how to really utilize them well. But overall there is really nothing negative about using them. I mean they really help to make our job a lot easier and yeah so I don't really see any negative aspects because yeah besides the training and first phase of technology acceptance.	DT-BDA
29 I:	Okay. Now, let's talk about blockchains. Are blockchains something that you're using in your auditing department.	
30 P:	Oh not really that I'm aware of. I'm not sure but I think we're sort of on like going towards that but we just haven't really implemented it yet. I think that we're still like trying to figure out how to use it effectively.	DT-BCH
31 I:	Can you mention some ways that you think they could help you to do your job.	
32 P:	I'm not sure about that one. I'm not so into blockchains but I'm sure that if we could implement it, they would be helpful just making everything easier and more transparent as it may be used as a distributed ledger that helps to record and verify transactions.	
33 I:	Okay. Can you mention a scenario where you see a limitation or would negatively affect your job.	
34 P:	I'm not sure because I'm not part of the whole implementation so I'm not exactly sure on how that would look like.	
35 I:	Okay. That's fine. Moving towards Artificial Intelligence (AI) and Robotic Process Automation (RPA). Are they something that used in your	

	auditing department?	
36 P:	Not extensively but I think that other parts of the firm, for example, our business process solutions already they're working more and more with RPA and so and I know that our clients enabled to have services with them. So, indirectly we also take part in it.	
37 I:	Yeah. How are they of use?	
38 P:	Well, I mean with everything needs automation. As for us auditors, every time there is an automatic control of something that makes the risk much much lower for us because you don't have the manual person sitting there doing something. We have to do less testing if there is an automation instead of manual. I mean quite often we work very risk-based and since there is less risk that comes with automation as compared to manual. Then it has a big impact on what we have to do and how we make sure that everything is correct.	PB-IR DT-RPA
39 I:	Ok. In what aspects do they help you to save your job.	
40 P:	Well, we don't have to take as many samples and yeah...	
41 I:	How they affected your jobs in any negative way?	
42 P:	Maybe the challenge can be that there is always a learning and adaptation process coming with new technologies. However, I would personally say that with these technologies like RPA, AI, Big Data, and Blockchains, we as the younger generation are more open towards it. So, it's more the older co-workers that might have a bit more issue adapting, as most of them are used to doing things the old-fashioned way. Therefore, resistance to change of technology can be observed in the more older generation of auditors. Also, about AI, sometimes you may train to AI to look for A, it can do well looking for specifically A. However, when a real agent reviews it, he/she might look A by also taking B and C into consideration. AI is good for looking at specific things when they are trained for, as sometimes machines and tools can miss the whole perspective where the only humans can vision.	PC-RC DT-AI
43 I:	Okay. With those mentioned technologies like all of them, how familiar and confident do you feel?	
44 P:	It depends, I would say like big data and analytics definitely more confident but using technologies like I don't really personally work with like blockchains or AI in that aspect I am more indirectly affected by it. But I think it's gonna come more and more. So, I don't feel as confident working with AI or Blockchains.	
45 I:	Okay and did you receive any prior training on how to use them from the former education or your workplace?	

46 P:	Yes, during my university time, we did work some with a Qlick for data analysis. Also, we do have training on the job at Deloitte in how to use tools like PowerBI that's for analytics right yeah	PC-CU
47 I:	Okay. Have you tried further to familiarize yourself with those technologies by yourself?	
48 P:	I am a bit just doing some reading and stuff that I wouldn't say in like any serious aspects. And my boyfriend is a computer engineer so I kind of get a lot of talk at home about the technology of modern times.	
49 I:	How would you react if you were informed that you will have to start using those technologies more in your work routine?	
50 P:	I would say that is fine but I would require some prior-training.	PC-CU
51 I:	In general, what are your feelings towards digitalization for the audit profession?	
52 P:	I would say positive as we are moving more and more towards having everything digital and I think especially now with the COVID-19 crisis, it really shows how far we've come. As we can do our job from remote and it doesn't really affect the quality much. It is also making everything easier I would say. Simple tasks are probably going to disappear more and more and we are instead going to focus on more complex areas that are more fun to work with. So I would say in general I'm positive.	
53 I:	Okay. Are there any specific parts of your profession that you think they're most affected by digitalization?	
54 P:	I would say, in general, the auditing responsibilities may change a bit. Probably like the monotone and simple tasks can be replaced by automation. Instead, we focus on more complex and important tasks.	PC-NAP
55 I:	Do you think digitalization has added quality in the auditing process?	
56 P:	Yes, I think it has a positive impact on the quality because like I said before it sort of shifts our focus to more important and valuable. Now we can be more specific and really look towards okay the risks and the outliers by focusing where it should be instead of just looking at everything.	PB-IAQ
57 I:	Okay. Do you think that digitalization has reduced the number of repetitive or boring tasks?	

58 P:	Yes. Let's say before you got like so many papers and you have to manually flip them and look for something where you can today just like do a quick search and or filter on the data. So, it makes those tasks a lot easier and much faster to perform.	
59 I:	How do you envision digitalization's future impact on your field? What changes will it bring you?	
60 P:	I definitely think that we will have less repetitive tasks and not and instead focus more on the complex areas where we can provide value for our clients and just be more consulting and more developed on interpreting loss. So, in general focusing on more interesting tasks instead of simple and boring ones.	PB-FE PC-NAP
61 I:	Do you think digitalization will be more prevalent than it is now in the future?	
62 P:	Yes, I think especially now with the whole COVID-19 crisis, everything speeding up. We are even seeking digital solutions that can reduce business travel and performing tasks from remote. So, I think that is definitely going to be more prevalent and we're already seeing it happening.	
63 I:	Okay and what do you think is or will be the impact of digitalization on the number of auditors required to be employed?	
64 P:	That is a hard question. As I said, simple and repetitive tasks are probably going go away so you would think that there will be less employed people but in fact, I think there is going to be more shift in audit profile regarding its tasks. So, I think our responsibilities might change in a way that we will focus on more complex areas and, but I do not think it will extremely affect the number of the auditors employed, maybe small decrease, but instead their responsibilities and audit profile.	PC-NAP
65 I:	Okay then how satisfied would you say you are about digitalization's impact on your job and why?	
66 P:	I would say I'm very satisfied because I feel like I want to do a job that's interesting where I can really do fun things that provide value I don't want to sit and do repetitive tasks like that's not why I went to university and got a degree. So, as I said digitalization sort of changed the auditing job and it made it more appealing by removing repetitive and boring tasks. We as auditors are using all of these new tools to help us do our job and do it better and more effective way.	PC-NAP
67 I:	What do you think are the benefits, opportunities, and risks that you think digitalization will bring on auditing or already exist?	

68 P:	I mean there are definitely going to be more opportunities I would say to shift of focus on more important and complex areas in auditing, as it provides more effective outcomes and values for clients. As a risk, there are not many to mention but I'm just thinking like a security. Since everything sort of happens online these days like how do we keep data safe and this is something that we work a lot with on how to share things with clients and how we should send stuff. So, in general information or data security can be considered as a risk that technologies and its availability to malicious users can give rise to security issues. This risk still remains and even can increase.	PB-IAQ PB-IR
69 I:	Okay and as a final question do you think it's harder or easier to be an auditor now than in the past and why?	
70 P:	I think it's probably harder these days since we have to be more adaptable these days. Today you really have to keep up with new technologies and learn new things all the time and we have like changes in our computer systems all the time with what tools we use and how we use them and how we can improve. So, we have to put more effort to train ourselves in order to keep up with these digital changes.	PC-NAP
71 I:	And do you think the skills or requirements to be an auditor are going to change in the future?	
72 P:	Yes. We see it already. we are using more and more IT auditors like people with a competence of technology and IT background and that helped us with IT systems. I think we're going to seem more like a merger between like computer engineers and people studying business because you do need skills in IT and computer systems more than before.	PB-CU PC-NAP
73 I:	Would be alright with you if we contact you in case any information or clarification is needed?	
74 P:	Yes, of course.	
75 I:	Okay. Would you like to receive a copy of the study once it has been published?	
76 P:	Yes, sure, that would be very interesting.	
77 I:	Okay and is there anything you would like to ask us?	
78 P:	No, I don't think so. Who should I send this recording to?	
79 I:	Okay that was the other thing I want to ask you is if you can send us the recording but do you need any help with that or do you know?	

80 P:	Well, I think it is automatically saved somewhere and then I can send it.	
81 I:	Okay thank you very much for some insights and your time.	
82 P:	Okay, good I hope this was helpful.	
83 I:	So thank you for your participation.	
84 P:	Thank you	

Appendix 4 Interview transcript – P4

Company: KPMG
Interviewee: Participant 4
Work title: Qualified auditor
Date and Time: April 9th 2020

Line	Transcript	Code
1 I:	Ehh first of all we will say a bit the purpose of our study is to study the effects of digitalization on auditing. It's a study investigating the benefits and challenges of digitalization just as a reminder. I would like to ensure you there is no right or wrong answer. We are just examining views and opinions to see where the auditors stand. Ehh also your participation is going to be anonymous we are not gonna use your name we might only use like ahh say we have X number of KPMG employees, X number of Deloitte employees here our findings.	
2 P:	Okay I understand.	
3 I:	You also have the ability to revise the transcript or the answers like if at any point later you wanna change your answer or add something you can tell us and let us know. (participant hmms in agreement) Okay, and I don't know if you have any questions before we start with the interview.	
4 P:	No, I am fine. I think we should start and then we see if I have any questions.	
5 I:	Good. So, what are your working and educational background?	
6 P:	Ehh I have been studying at Lund University and I have a master's degree. As far as working I have been, I have had temporary work during summers and during my study time. And after I was finished with my studies I started at KPMG. So that is the story.	
7 I:	How many years have you been working as an auditor?	
8 P:	Oh, almost 9 years.	
9 I:	Okay 9 years. And what is your current work position and responsibilities within your organization?	
10 P:	I am an auditor and I am a qualified auditor so I am authorized and I work on the teams.	

11 I:	Okay, and how would you describe your relationship with computers and technology in general.	
12 P:	I would say I am familiar; I am kind of eh it's not unfamiliar territory for me (interviewer hmms). And that I am not an expert but I have some routine on it.	
13 I:	Okay and what do you know about digitalization, like how would you define it or describe it?	
14 P:	Ehh oh I would describe digitalization as some form on IT structure to help and make processes more efficient. And... (interviewer hmms) and yeah.	
15 I:	Could you name some technologies associated with digitalization either in auditing or in general?	
16 P:	I am not really that good at names. But I think that common ahh common names dropping now its AI and so forth.	
17 I:	Okay, so about big data and analytics. Are those two something used in your auditing department?	
18 P:	I would say so. We analyze big data from our bigger companies and we also analyze data from our small companies is not like big data in that census that is a lot of data but it's the same structure of big data. So, I believe you can say it's the same thing.	DT-BDA
19 I:	Okay and how to say, can you elaborate a bit on how exactly you use them either big data and analytics.	
20 P:	Yes, we collect data from the companies ehh from their accounting systems amongst other systems and then we analyze in our tools so we make analytical procedures, we test connections between different parts of the data, we make statistics to show the trend over time. That is some of the things we do.	
21 I:	Okay, and how often does that happen. Like how often are they of relevance in your work routine?	
22 P:	I would say we use it every day so we do the analytics in every company, we audit to some extent and, in some companies, we use it more and in some not as much as in others. So, it affects my work on a daily basis.	
23 I:	And in what aspects do they help you do your job, you think?	
24 P:	I believe it helps to reveal connections and trends and in that way, we can analyze the information and discover if there is anything not in line with our expectations and that helps to understand the company and it helps to ehh find any relevant issues and outliers.	DT-BDA

25 I:	Okay and do you think they have affected your job in any negative way?	
26 P:	No, I don't think, I think it helped a lot. It makes the process easier and more relevant information in the output than before. So just their type of analyst and analysis we make now I don't see any negative ways. However, technology as a whole can affect the work negatively in the way that you do not learn in the same way and why you do certain things and how you should interpret the result because you don't know exactly what the computer is telling you (interviewer hmms). So, before we had this help you you need to calculate by yourself and then you learned how to calculate and how to reflect on the output. (interviewer okay) So I think it makes it harder for new people starting in the business to understand what it is we are doing actually.	DT-BDA PC-NAP
27 I:	Okay, that is interesting. Moving on to blockchains, are blockchains something that is used in your auditing department?	
28 P:	Ehh I am not that familiar with blockchains. So, if you can explain what it is, I might have a better answer (participant laughs).	
29 I:	Ehh blockchains are like how to say do you know bitcoin or...?	
30 P:	Yes.	
31 I:	Ethereum something like that. It is a decentralized currency exchange so to say.	
32 P:	Ah okay.	
33 I:	They are not moving through banks they are like peer-to-peer. Like we are a network and we have how to say we verify between us that this transaction happened and it is right and stuff basically. So, it takes banks outside let's say.	
34 P:	Okay, in that case, I would say we have no effect on it in our auditing. And so far, I have not had any customers or clients that have this kind of currency. So, I would say we have not seen very much of this type in our work.	DT-BCH
35 I:	Ehh so can I ask why not?	
36 P:	Why there are not using this kind of ehh?	
37 I:	Yeah in general, like even your company why doesn't incorporate let's say bitcoins.	
38 P:	Oh, I don't know. Maybe because it is like not that familiar in our business line. I believe sometimes it's seen as something for the black market so to say or something. it's not common in our ordinary companies, today, ehh and I think that is because of the lack of knowledge about it and	

	what it is and how it works and how it is working.	
39 I:	Even though, as you said you are not very familiar, could you mention some ways they could help you do your job?	
40 P:	Ehh ohh that is a hard question, I don't know (participant laughs).	
41 I:	(laughs) Okay that is okay. We move on, we go to artificial intelligence and robotic process automation. (participant hmms) Are those something that is of use in your auditing department?	
42 P:	I would say that it's a common topic and you hear a lot about it. Ehh they ehh, however, I think that most of the artificial intelligence today is not made by artificial intelligence, it's manual work from someone telling you that this is artificial intelligence. Ehh however I think there are big plans to use this. And in my company, there are a lot of investments made at this time to explore the possibilities of working with this type of technology. And make it help us in our work. And I think there are a lot of possibilities for to ehh to make our work easier and to do things in a different way based on this type of technology.	
43 I:	How would you say they are of use?	
44 P:	I would say it will help us to ehh today we analyze a lot of data and we make assumptions and we make expectations. However, all this is based on the knowledge that we as auditors have so when I make an expectation, I do that based on the information I have about the company and the information about other clients I had. But when you use this type of technology you can use the overall information in the company. So, I can get a result based on other apartments and other companies that I don't work with. And the computer can make the expectations based on the whole work we may make in their firm and see relevant connections and then make more intelligent decisions of what is an outlier and what is relevant to follow-up in the audit based on more information that I as a person can access at any time.	PB-IAQ
45 I:	Okay, how often are they of relevance in your weekly work routine you would say?	
46 P:	I would say every day. So as soon as we are auditing a company it would be relevant for us.	
47 I:	And in what aspects do they help you do your job?	
48 P:	I think they help us to be more intelligent and to make better assumptions, to create better expectations, to compare the relevant output with.	PB-IAQ

49 I:	Okay and do you think they have affected your job in any negative ways?	
50 P:	At this time, I don't think so but as I was speaking of before, I think there is a risk going forward (interviewer hmms) that new employees will not learn the work from the bottom. So, it will be hard to analyze the output because you might have a hard time understanding when it comes from.	DT-AI DT-RPA PC-RC
51 I:	Okay, any challenges maybe that this brings? These technologies.	
52 P:	I think the challenge is to make people work in a different way. We are quite used to sampling and reviewing documents. But when you have this technology to help you, you have to work from a different angle. You have to do more analysis and follow up on outliers and things that pop up as not normal. And that is a different way to think about our business.	PC-RC
53 I:	Okay. Now about technologies in general. For these technologies actually, all the prementioned ones from big data to AI. How familiar and confident using those technologies.	
54 P:	I would say I am quite familiar with using analytical technologies, analyzes, and so forth. And the technology of and the other technology is quite unfamiliar at this time. However, it is becoming more and more familiar.	
55 I:	Ahh those were for blockchains and AI, right?	
56 P:	Mmm, yeah.	
57 I:	Did you receive any prior training on how to use them from your former education or in your workplace?	
58 P:	For my former education I would say no. When I went to school it wasn't that familiar with technologies or IT whatsoever. Perhaps we used Excel to summarize numbers but that is all. Ehm I would say in my workplace we get a lot of information and education on how to work with the new tools we are developing.	PB-CU
59 I:	Okay, eh did you further familiarize yourself with them?	
60 P:	Ehh yes. I would say that it is part of my daily work and will be required of everyone working with the audit. (interviewer hmms) And I am a person who is quite interested in new technologies and how they can make my work easier. I have a lot of work to do so it's kind of I need to have	PB-

	help from technologies because otherwise, my workload would be over-whelming. So, I see that I have to adapt to it to make my life work, I would say.	CU
61 I:	Okay, so how would you react if you were informed you will have to start using them more?	
62 P:	Ehh we have had very much of that information lately and it's kind of tir-ing to get new work new ways to work all the time. So normally I would be positive and thrilled and this would be fun to try out new things. (in-terviewer hmms) However, we are quite tired right now on the new sys-tems and the new workflows I would say. But normally I would be very positive .	PB-CU
63 I:	Okay and about digitalization in general. What are your feelings towards the digitalization of the auditing profession?	
64 P:	Hmm, positive. I am sure it will help in our daily work so ehh it's inter-esting to follow the development. I think it will happen much in the com-ing few years, on this area.	
65 I:	Are there any specific parts of the profession that you think are most af-fected by digitalization?	
66 P:	I would say all of it. There is a transformation ahead I believe. And that will change the work somewhat from normal auditing to more consulting and helping the companies understand their own businesses.	PC-NAP
67 I:	Do you think digitalization has added quality in the auditing process?	
68 P:	I believe it has, if it's used properly, in the right way (interviewer hmms). It helps to be efficient and make the quality of the work better. But if it's used in the wrong way, I think it will end up in the opposite direction.	PB-FE PB-IAQ
69 I:	Yes, do you think digitalization has reduced the number of repetitive or boring, so to say, tasks?	
70 P:	(exclaims) Absolutely! (interviewer laughs) (participant laughs) It's much easier to process larger amounts of data. This means we can be more in-telligent when we make samples for example and that helped to reduce the sample size. So, for just as an example.	PB-FE
71 I:	Okay and how do you envision digitalization future impact on your field. What changes will it bring?	

72 P:	I think it will have a big impact. You can already see some impact in accounting where more and more accounting is made automatically and I think that is coming to the audit as well. More and more of the audit procedures will be done automatically. And you will have more focus in specific areas to follow up on.	PC-NAP
73 I:	And do you think it is going to be more prevalent than it is now?	
74 P:	Yes, I believe so.	
75 I:	Okay, ehh what do you think is or will be the impact of digitalization on the number of auditors required to be employed?	
76 P:	I would say you would think that there would be fewer employees because we are getting more help. However, I think that the audit profession will change a bit so you will be more of a consultant to the client and as a whole, I do not think the employees will be fewer. It just will change what we are doing and how many clients we can handle at the same time.	PC-NAP
77 I:	So, the number will be will stay the same?	
78 P:	I believe so.	
79 I:	Okay, how satisfied are you personally by digitalization impact on auditing?	
80 P:	Ehmms I am quite satisfied. I think it makes the work more intelligent. I think it opens up possibilities for more consulting and I think it narrows the expectation gap, between we are doing and what people think we are doing. Now we can analyze the total amount of the transactions instead of sampling so.	PB-REG
81 I:	Okay and what do you think are the benefits, opportunities and risks that digitalization brings on auditing?	
82 P:	I think the benefits are efficiency, there is a quality and more intelligent questions and the "narrowisation" of expectation gap. And I think the opportunities. So, it opens up for more ehm more parts of the audit that we can offer to our clients. And it makes more time to helping in other ways. (interviewer hmms) And the risk, I have mentioned before, I think it is easy to forget how to do things when someone else is doing it for you. So, I think it's a risk to forget why we are doing certain things.	PB-IAQ
83 I:	Could you elaborate a bit on the expectations gap you mentioned?	
84 P:	Mmm I believe today there is a large expectation gap between what companies believe we are doing and not only the companies ehh and like	

	people in general. I think the expectation is that we are auditing and we are looking at every transaction and that is not the case. We look at what we think is relevant and we focus on the risk which we have found. So, we are not covering all of the transactions and all of the things that are happening in the company. And I believe that people around us expect us to do that. So, they are quite disappointed when we don't identify a smaller mistake in our view. But that is the way we work. So when we can use technology to analyze all the data, we can focus on the outliers instead of just, today we have to focus even on the things that are right to ensure they are right but when we have the tools to analyze the data we can focus on the outliers and therefore we can cover a much larger amount of the companies. Transactions and happenings during the year.	PB-REG
85 I:	Okay and do you think it is harder or easier to be an auditor now than in the past and why?	
86 P:	Oh, I can only relate to the nine years I have been working. But I think it's been and since I started work for when I started working as an auditor for nine years I had very different things on my agenda. Because I wasn't an associate at that time. So my type of work has changed because I am ehm more knowledgeable, I know more now so I do other work, so I have a hard time to answer that question because I haven't been in the business for so long but I think absolutely that it has been easier in some ways (interviewer hmms) but harder in others. Because there are more questions about how everything is affecting the company.	
87 I:	Yeah but if you had to choose one so to say you would say it got easier or harder but also in relation to digitalization.	
88 P:	Okay I would say it has been easier, it's easier now. Because you are more used to the technologies and the technologies are more refined. So, the technology is better and easier to use. So that's one way it has been easier.	PC-NAP
	(short conversation ensues but is not of relevance to the study)	
90 P:	Absolutely. (interviewer ehmms) You will need more knowledge about computers in general and certain programs in the statistic. And you will also need to be more of a consultant and not only an auditor, I believe.	PC-NAP
91 I:	And what changes do you expect to see?	
92 P:	Yeah, I expect to see some changes in the way we work that we will audit from another perspective and I think our daily work will change in the way that we will do more before visiting the clients. I believe we do more	

	after visiting the clients so to say.	
93 I:	Okay ehh that was the last question.	
94 P:	Hmm.	
95 I:	Is there anything we have not brought up and you would like to mention?	
96 P:	Emm no I don't believe so.	
97 I:	Okay, ehh would it be alright with you if we contacted you in case new information or a clarification is needed?	
98 P:	Yes absolutely, just contact me.	
99 I:	would you like to receive a copy of the study once it has been published?	
100 P:	Mmm ah yes that would be interesting.	
101 I:	Okay, is there anything you would like to ask us?	
102 P:	Ehmm no I don't believe so.	
103 I:	Okay so thank you very much for the interview. We got some interesting info.	
104 P:	(laughs) yes.	
105 I:	We were on time, we were even shorter, I would say 10 minutes.	
106 P:	(laughs) yes.	
	(Exchanging information on how the interviewee can send us the recording.)	
107 I:	Okay, so thank you and have a good day.	
108 P:	Thank you, have a nice weekend!	

Appendix 5 Interview transcript – P5

Company: PwC
Interviewee: Participant 5
Work title: Auditor
Date and Time: April 14th 2020

Line	Transcript	Code
1 I:	Okay so first of all, how are you?	
2 P:	I am fine thank you. How are you?	
3 I:	We are fine as well, thank you for joining in (participant ehms) the study. So, as we said, you allow us to record right?	
4 P:	hmms in agreement.	
5 I:	We are recording right now. Ehh the purpose of our study is to investigate the effects of digitalization on auditing. It's a study investigating the benefits and the challenges of digitalization on the audit profession (participant hmms in agreement). I have to ensure you that there are not any right or wrong answers. We are just interested in your opinion or your thoughts about digitalization (participant hmms in agreement). Also, all your answers will be anonymous we are not gonna make any mention of your name. We are just going to mention the companies that we got participants from like we got four people from PwC, four people from Deloitte here our findings. Is that alright with you?	
6 P:	Yes.	
7 I:	Okay, you also have the ability to revise the transcript or modify any answers you give us at any point. Even during the interview or after the interview as long as it is before we submit our thesis (smiles) (participant hmms in agreement). Ahh do you have any questions before we begin?	
8 P:	Do you where do you write your thesis is it Lund or?	
9 I:	Yeah Lund for Information Systems.	
10 P:	Yeah.	
11 I:	That's our masters. (participant hmms in agreement) Okay so let's begin with our main questions. So first of all, what is your working and educa-	

	tional background?	
12 P:	Ehm I have studied Economy before in Lund and I have worked at PwC for 16 years now (interviewer hmms in agreement). So ahh	
13 I:	And what is your current work position and responsibilities within your organization?	
14 P:	I am an auditor. I'm an auditor and I'm responsible auditor in about a hundred companies (interviewer hmms in agreement). And I also have an internal role in our management team in Scania. So, I have two roles; one external, one internal.	
15 I:	Okay how would you describe your relationship with computers and technology in general?	
16 P:	In PwC?	
17 I:	No in general, like in your private life let's say.	
18 P:	Yes, for me or in general, people in general?	
19 I:	No no for you, how good you are basically with computers you would say?	
20 P:	Ehm maybe medium or something. I try to test the new like system and applications but I am a bit older than the youngest so I think I'm a bit medium.	
21 I:	Okay, and what do you know about digitalization. Like how would you define it let's say?	
22 P:	Ehmm yes, it's a bit difficult to put in words but ehmm yeah (laughs) (interviewer smiles). What could I say? Of course, less paper and more like in the system information put in some some logical system or something.	
23 I:	Could you mention some technologies associated with digitalization either in your field or outside of it?	
24 P:	For instance, do you have any examples?	
25 I:	Ehh it's mostly for you to say some technologies if you can. Like if I have to say an example you know AI (participant yeahs) artificial intelligence. Can you name any other similar?	
26 P:	Ehh robotics (interviewer hmms) yeah machine learning is more or less the same, I guess. Ehmm I am not so into details but of course blockchain and as well.	
27 I:	Okay yeah that is fine. So about big data and analytics. Are big data and	

	analytics something that is of use in your auditing department?	
28 P:	Yes. Big data of course we try to use more and more. Ehmm but ehmm we use a lot of our own data at least and we do a lot of analytics based on the figures of the company. (interviewer ok) So that is an important tool in the audit.	DT-BDA
29 I:	Is big data and analytics something that you personally make of use in your work routine?	
30 P:	Yes, every day.	
31 I:	Every day.	
32 P:	Yeah.	
33 I:	And howw ehmm how to say, how would you say that they help you do your job?	
34 P:	Ehmms you can benchmark and you can do analyzes between the years for one company and you can benchmark against other companies of course in the same brunch or (interviewer ehms) like the same sizes or the same region etc (interviewer ehms). So ehh is very helpful in the audit to do all these comparisons.	DT-BDA
35 I:	have the-	
36 P:	Because you understand better.	
37 I:	So basically, you say they help you understand better?	
38 P:	Hmms in agreement.	
39 I:	Okay, do you think they have affected your job in any negative way? Or maybe they can bring some challenge when you use them?	
40 P:	Yes, but I think it's mostly helpful because when you do analytics and you have this help from the data it get ehh you can like get an understanding more easily so I think it's just helpful. I cannot see any anything negative about it.	
41 I:	Do you see any kind of challenge when using big data or analytics in your field?	
42 P:	Yes of course it's important to handle the data correctly of course because we cannot just collect a lot of data because we have to handle it correctly and use it in the right way. So that is of course something to be aware of.	DT-BDA

43 I:	Okay don- (participant tries to speak) do you wanna say something more?	
44 P:	No, we ahh of course have a lot of years as auditors from our customers onn there are a lot of data also like public to anyone. So that is more easy to use of course but is very sensitive but we we are used to that as auditors. Because we ehh don't talk about our clients to anyone for instance. So, we have very high security on the systems so. But of course, is very important to be aware of.	
45 I:	Hmm you don't perceive training or you know learning how to use big data and analytics as a challenge?	
46 P:	Ehh yes it could be a challenge if you use it in the wrong way of course. (interviewer hmms) But when we do the analytics more like from analytics based on the previous year's data from the customers that's the data that we already had. So of course, is more challenging to collect data from other sources of course.	
47 I:	Okay, moving on to blockchains. (participant hmms) Are blockchains something that are in use in your auditing department?	
48 P:	Ehhm I think maybe we are trying something but I'm not so familiar with blockchain in the audit. I have just heard it more like on personal.	DT-BCH
49 I:	Okay, do you know why there are not of use in your department now?	
50 P:	I think that is more in our departments with the ahh and like (laughs) Information System and the IT department auditors that are more into system. I think they are much more aware of it. But for me as a general auditor I am not so familiar with it.	
51 I:	Soo blockchains are not something you make use in your work routine, right?	
52 P:	Not that I am aware of. It could be of course integrated in some system but not according to my knowledge at least.	
53 I:	Can you think why not they are not of use?	
54 P:	Ehm I don't know if it's maybe it's more difficult to apply it into the ordinary business. I am not sure.	
55 I:	Could you mention some ways you think blockchains could help you do your job?	
56 P:	(thinks to herself) I am not sure. Do you have any example?	

56 I:	Ehh I have but is like (smiles) (participant laughs) we are trying to get your opinion you know so I cannot really help (participant yeahs).	
58 P:	I am not sure.	
59 I:	So, it's fine like I can tell you that all our participants by now have not really been with blockchain at all, they don't really know so.	
60 P:	This is of course my personal so that's not PwC. Because if we have talked to anyone more IT skilled person, they would have known, I guess.	
61 I:	Yeah, maybe but we are investigating auditors so you know (both smile). Anyway, moving to artificial intelligence and robotic process automation. Are those something that are of use in your auditing department?	
62 P:	Yes, we use it.	
63 I:	How are they of use?	
64 P:	We have ehh delivery center in Lund. Where we have central departments that helping all our customers in Sweden. And there will also have a couple of ah robotics. But we have taught with machine learning to do more systematic tasks and more yeah easily tests.	
65 I:	Okay, are AI and RPA something that you make use of in your work routine?	
66 P:	Ehh not me myself but I have helped in my audits from from this department so it's used in my engagements but not from me myself.	
67 I:	Do you know why not?	
68 P:	Ehh we we do like the development on specific places in Sweden. So, it's more like I am not developing anything myself so I am just using it but of course we ehh we will use it more and more going forward and also AI in the audit etc.	
69 I:	(ehms) Can you mention that you think they could help you do your job?	
70 P:	Of course, it will be very helpful if we take robotics or machine learning that could help us with more easy tasks of course. That are more standardized and AI could of course help us when we do the sample that we can test the whole population in a much better way (interviewer hmms) in audit. So that will be very helpful to get like yeah. Today we sample a lot in audit and that is just samples. So, it will be very big difference in the future when we can test everything.	PB-IAQ
71:	Okay, about RPA actually. Hmm how to say, personally for you don't are	

	there not any mechanisms that you think are come of relevance in your daily work. You know automation basically. (interviewer hmms) Like I could explain a bit more, automation is even if someone sends you an email and you have an automatic response that's considered RPA. Do you have such mechanisms?	
72 P:	Yes, in some way. Of course, we have in ahh Google they write for you, guess what you are about to write for instance when you write to the email, but we don't have any automatic like replies or anything today. Not that I use but of course is very helpful. And also, the younger people that we employ (interviewer ehms) they are more they want to do a fast (participant laughs a bit) development in the company. So, it's ahh we need to have this help from robotics. Because when I was new, we could do like the same task for five or six years and accepting it but (participant smiles slightly) the new stuff don't accept that in the same way.	PB-FE PB-ARG
73 I:	Okay, could you mention a scenario where you think their implementation would negatively affect your job?	
74 P:	Ehmm, if we forget the customer for instance, it's the customer is our base besides the people that work at PwC. But of course, it's important to not forget our customers. To have this relation is very important. So, it's good with digitalization but it cannot be the only thing.	PB-REG
75 I:	Okay, how familiar and confident do you feel using all those technologies from big data and analytics over to AI?	
76 P:	Mm-yeah medium we use it but it's more it's not fully implemented so. It could be much more of course but it is fun to try.	
77 I:	Hmm okay ehh, with which you think you are most confident with? From those.	
78 P:	Mmm maybe analytics.	
79 I:	Okay, did you receive any prior training on how to use those technologies either from your formal education or your workplace?	
80 P:	Emm yes, we have the training on the job when we have like a new application or something, we train the people. So, we have it.	PB-CU
81 I:	So, you got some training in from PwC let's say (participant yeah yeah). But from your education?	
82 P:	It was so many years ago (laughs). I was in school so digitalization was not so developed.	
83 I:	Okay.	

84 P:	We like used Excel that was the most digital, we had like floppy disks (laughs) to save our essays etc so it was not so big.	
85 I:	How many years do you work as an auditor?	
86 P:	Sixteen (16).	
87 I:	Have you tried to further familiarize yourself with those technologies?	
88 P:	Ehh not tried but of course I read yeah I try to like how to apply it and read good examples and that stuff but not more than I have like if you buy something and you get those advertisements etc. So that is not me trying but of course I see AI in my personal life.	
89 I:	And how would you react if you were informed that you will have to start using those technologies more in your daily routine as to say?	
90 P:	I think it's uhh I welcome it. So, I think that maybe I would like it to be further on somedays. Because fast in some way but in some other ways I would like to be testing everything now, so.	PB-CU
91 I:	So, you are open to the idea let us say.	
92 P:	Yeah yeah.	
93 I:	And what are your feelings toward digitalization of the auditing profession?	
94 P:	Yes, I think it's very good because we have this new newly employed that are not, they don't have the same patience and then we can offer them better development to go more fast-forward and do more like analyzes and meeting with customers with ehh yeah. And not sit like do your samples for 10 years before you are there so I it's very very good . But of course, we don't have to forget our people both the customers and our people. So, and now in this corona days we work from home. (interviewer hmms) So we have all the meetings like this in video. So that is of course good, but you miss your colleagues so you would like to meet also. So that's very interesting to see that it's good in 95% but then you-(interviewer interrupts)	PB-FE
95 I:	Why do you think it's good that you are working from video?	
96 P:	Ehh because you can see each other and you have more like yeah short meetings and ehh check in and check out etc. But then the last 5% you would like to meet your colleagues. Give them a hug etc and just yeah. Face to face in real life. So, it's very good with digitalization (participant smiles) but you can't forget the people behind it.	
97 I:	Okay, are there any specific parts of the profession that you think are the	

	most affected by digitalization?	
98 P:	Ehh with my work or in general?	
99 I:	With both if you want, we don't mind.	
100 P:	I think of course this audit are audit like a job will be affected a lot of course. Because you can use AI technologies etc on it and I think that maybe yeah. I am not sure but we are like listed as one of the highest that would be affected most maybe it's accountants. We are not accountants, but audit as well it's ranked in the top at least. So, I think- (interviewer interrupts)	
101 I:	Why do you think you are in the top of being candidates for digit- (participant interrupts)	
102 P:	Yeah, because it's a lot of data you can systemize it you can like repeat and yeah. There is some logic in our way to do an audit. And it's also of course that more like we have a lot of regulations and that is also of course interesting to go into that.	
103 I:	Yeah, ehh do you think digitalization has added quality in the auditing process?	
104 P:	Yes, yes.	
105 I:	In what ways or in which cases?	
106 P:	For instance, about the samples because of course even if you have like a statistic model with the samples then of course, it's more I have a higher comfort if I test everything of course. Like with AI so it will add quality I think (interviewer hmm). If you use it in the right way because you cannot stop thinking (participant smiles) yourself. So that is of course the risk if you just depend on the computer and don't analyze it ehm.	PB-IAQ PB-IR
107 I:	(waits a bit) Are you?	
108 P:	No no.	
109 I:	Do you think digitalization has reduced the number of repetitive or boring tasks?	
110 P:	Yes, a bit. But now when we are like in the beginning of it, I think it also adds tasks because we don't have the correct set up yet in every system etc. So, until we are there you have to yeah give input to the computer then you don't save time in the beginning.	PB-FE
111 I:	So that is actually a challenge for digitalization, right?	
112 P:	Yes, I think so.	

113 I:	But in what ways do you think or in which cases have digitalization reduced these tasks, the repetitive and...	
114 P:	Yeah, when you have been like ahh educated the computer and you have a like structured information in a certain way. then you get help from it. So, it's more like yeah development also in that case but in the very beginning, you are not saving time.	
115 I:	Okay, and how do you envision digitalization's future impact on the field? Like what changes will it bring?	
116 P:	I think it will be yeah, I think it most cases will be attractive to yeah new people that we will hire. Because I think that it's more fun to work if you have like help from the computers to do a lot of the work and you work and. But time to meet the customers and analyze is the fun part of the job. So I hope it will develop us more attractive work.	PB-ARG
117 I:	So, you actually think digitalization will or makes auditing more attractive to young people?	
118 P:	Yeah, I hope so at least.	
119 I:	So, you can say that it can increase the reputation of auditing?	
120 P:	Yeah, yes, I hope so both for the younger people to see it more attractive and also maybe the customers see more higher value when we can like test a lot of the transactions. Because I think today, we have like I don't know the English word but in Sweden is called (Swedish word). You have a gap between their expectations of what an auditor do and what we do in reality. So, they think that we look at everything but we don't, we make samples. So, if we can test everything with an AI computer, then of course the customer will be more satisfied (participant laughs a bit) and comfortable as well.	PB-ARG PB-REG
	(short discussion about the Swedish word mentioned)	
121 I:	Okay, do you think digitalization is going to be more prevalent in the future than that it is now?	
122 P:	Yeah, it's relevant today. But I think it of course it will be even more relevant. There is like yeah now we cannot go back it seems very old fashioned to do it like the old way (interviewer hmm) so very much.	
123 I:	Okay, and what you think is or will be the impact of digitalization on the number of auditors required to be employed.	
124 P:	Maybe it will in some way require less auditors (interviewer hmms). But in some way, I also hope that we can be more relevant to the clients and that we in that case we add more value and help for the customers and in that way, we maybe be even more auditors. Because they will have more	PB-IAQ

	help from us and see a higher value of our product. So, in the beginning maybe less but in the longer run I hope we will do bigger impact and maybe we can help new ehh yeah new different kind of audits in the society that we don't do today. So, I hope will get new ehh yeah, we will have a development in that offering to the clients.	PC-NAP
125 I:	Okay, and how satisfied would you say you are personally by digitalization's impact on auditing as of now and why.	
126 P:	How do you mean how?	
127 I:	How satisfied are you, personally.	
128 P:	With the? With the what?	
129 I:	With digitalization as of now.	
130 P:	Yes, I am pretty happy I think that we have come a long way with the robotics, I am proud of that. But I am very eager to (participant laughs) yeah come longer ahead of course.	
131 I:	Okay.	
132 P:	But it also takes time to adjust so we can't go too fast forward.	
133 I:	Okay, and what would you say are the benefits, opportunities and risks that auditing brings on auditing?	
134 P:	I think it's of course eh risk is as I said if you forget the customer or forget your people, the staff. But there are a lot of opportunities so I think they are much bigger. For instance, that you do not take these samples and that you can get a bigger knowledge about the customers. Get a better understanding and maybe also yeah make predictions of the future etc.	PB-IAQ
135 I:	Okay, ehh a last question. Do you think it's harder or easier to be an auditor now or than in the past and why?	
136 P:	Huh difficult question. I think it's harder because in some way because we have a lot more regulations today than- (interviewer interrupts).	
137 I:	More relevant to digitalization.	
138 P:	Okay, then I think it is easier to be an auditor. Yeah because you have this support.	PB-FE
139 I:	You do not think that these technologies have added the requirement for auditors to be more IT savvy, you know?	

140 P:	Mmm yes.	
141 I:	More knowledgeable and stuff.	
142 P:	Yes, maybe it's dependent on who you ask because if you are ehh I am in the middle. I am forty. So, I have worked my half half the life and of course I have a lot of years to work (interviewer nods). But if you are like sixty and you have like 5 years left then maybe you do not adapt and then of course, it's I guess they see it as more difficult. And I think that the new colleagues they develop very fast today so I think that they think that is easier now that when I was new. They are more skilled.	PC-RC
143 I:	Do you think in general the competence for auditing profession is increased with digitalization?	
144 P:	Ehm between the firms?	
145 I:	Yes, for example as an employer ehh nowadays have they required more skills and more competence from auditors? Because if you know digitalization and the skills it requires from you to work with.	
146 P:	No, I don't think so because we also we train our stuff inside the company. We have always done that way. So, we are used to that you do not know that much (participant laughs) when you come from school. We give them a lot of education on the job .	PB-CU
147 I:	So, digitalization might be an advantage for you like you will just get upskilled.	
148 P:	Yeah, yes that could be an advantage. It's like the level increases.	
149 I:	Do you think the skills or the requirements are going to change in the future?	
150 P:	Yes, I guess it will be more like relevant to have IT background like you (refering to the interviewer's computer education background) in some way. Maybe it's a combination of economics and IT. Because of course you have to have the analytics as well so it's not only IT. But I think it will be relevant with a mix.	PC-NAP
151 I:	Okay. So those are all our main questions.	
152 P:	Yeah.	
153 I:	Is there anything we have not brought up and you would like to mention?	
154 P:	No, I do not think so. Is it your master thesis?	

155 I:	Yes.	
156 P:	And then you are finished with school?	
157 I:	(interviewer smiles) Probably.	
158 P:	Nice, oh that is nice.	
159 I:	Yeah eh.	
160 P:	No, I don't come to think of anything.	
161 I:	Okay, will it be alright with you in case we contact you in case a new information or clarification is needed?	
162 I:	Okay, would you like to receive a copy of the study once it has been published?	
163 P:	Yes, that would be nice.	
164 I:	Okay. Is there anything else you would like to ask maybe now?	
165 P:	No, I don't think so.	
166 I:	Okay then, thank you for the interview. We've got some useful insights.	
167 P:	Yeah, yes.	
168 I:	Okay thank you very much for the interview and we wish you to have a nice day.	
169 P:	Yeah good luck! Bye bye!	
170 I:	See you!	

Appendix 6 Interview transcript – P6

Company: PwC
Interviewee: Participant 6
Work title: Senior auditor
Date and Time: April 17th 2020

Line	Transcript	Code
1 I:	First of all, the purpose of our study is to examine the effects of digitalization investigating the benefits and challenges of digitalization on the audit profession. I would like to assure you that there are no right or wrong answers, we are only after honest opinions. Also, your participation is anonymous we are not going to use your name at any point in the interview we will just mention company names like five guys from Deloitte, five guys from KPMG. You will also have the option to change your answer to something. If you want, you can add, change, or remove something after the interview.	
2 P:	Okay, fine. Will it be publicly available?	
3 I:	Yes. Do you have any other questions for us before we begin with the main part of the interview?	
4 P:	No, I think it's fine.	
5 I:	Okay. What are your working and educational background?	
6 P:	Yeah. I studied Business Administration and I concentrated on Finance. Currently, I'm doing ACCA that is a certificate for Chartered Accountants. So, it is in line with my profession as I'm working as a senior auditor in the assurance Department. I can also tell about my responsibilities. As a senior associate, one of my responsibilities is to manage a team but also I'm doing all the tasks that are more complex and associates cannot perform.	
7 I:	How many years have you been working?	
8 P:	It's 3rd year for me right now. Oh it's kind of two and a half or almost three.	
9 I:	How would you describe your relationship with computers and technology in general?	

10 P:	Well, I cannot say that I am a master or expert in anything but I find it really easy to adapt to new technologies and new software. It is quite important for me as an auditor to be up-to-date and skilled in new technologies as we are using it a lot in our work but I can't say that like I'm an IT, guy.	
11 I:	In your personal use, are you good with computers you would say you know how to manage the computer?	
12 P:	Oh, yes of course. I love experimenting and finding out myself how to solve the problems. I can say I have a good relationship with computers but not like the best IT guys with that specialty.	
13 I:	What do you know about digitalization or how would you define it?	
14 P:	Well. That's a word that is really trendy right now and everyone is using it in every context. I think it's a really general word but for me, it's the process that entities use when they want to digitalize their internal processes. It means they implement new technology or develop new software and they try to use as much technology as possible in their internal processes which is quite modern and what we have all had to do.	
15 I:	Could you name some technologies associated with digitalization in your field or outside of it?	
16 P:	Well, they're a lot but I don't know if I'm allowed to say the exact name that we have that PWC has developed internally. Well, we all know like Salesforce or Workday they like the main programs that are used by companies. We can tell many payroll management programs that they don't really need to sign a paper but everything is done digitally.	DT
17 I:	Are big data analytics something that is of use in your auditing department?	
18 P:	Yes, of course. We use data analytics and it's quite important for us personally. I'm not that involved because we have a special team that is working on big data analytics. We have one of our audit procedures referring to data analytics. For example, journal entry analytics where we use software to perform analytics over this journal entry that is like a big data from our clients. Then we have the analytics based on the criteria. We also have less complex analytics that we all do in assurance and that's quite easy and straightforward.	DT-BDA
19 I:	Are big data analytics something that you make use in your daily work routine?	
20 P:	Yeah, we have this internally developed software where we put the big data from our client we ask for a special format of the data we put in the software and then using this software we can pull out some reports or do some analytics as associates and seniors. But when it comes to more	

	complex big data then we have a special team working on it. I think almost for every client we are using the software that we use data analytics and it's really important as they expect us to use this software. It's part of our work. We don't use it daily but it's something that we do for every client. When we work with the client we work maybe one month two months or two or three weeks but we use it for every client because it's part of all the procedure to analyze the data like journal entries, trend or the payroll that we analyze each month and they look at the trend compare with figures or previous years. So, it's something that we use but I don't say like every day but for every client.	
21 I:	Could you say some aspects that big data and analytics help you do your job well?	
22 P:	One of the most beneficial things is effectiveness. So you don't really have to spend too much time figuring out how to do it but to take the software and click what you want to see what kind of report you want and then it's really fast and really efficient. Then another thing is that you can trust more on the report you get from your software than asking someone to prepare that has maybe hi-chance of human error. So, it's more precise and trustworthy when you have a report on the software. You can also be really flexible by using different criteria. Since we have a different kind of reports, we can really choose what kind of quality or analytics want to perform. So also it's really flexible and effective . Another thing is that as a consulting company, clients always expect us to be up-skilled and to use modern technology as possible.	DT-BDA PB-IR
23 I:	I: Do you think they have affected to you your job in any negative way or well maybe they can bring you some challenges?	
24 P:	I can't say they affected negatively in any way. I think it's a future question because in our audit profession and modernization of audit is a real future thing. Maybe in the future, we as human labor can be substituted by technology. So it can affect us in the future quite significantly. For some, it could be really challenging because they don't really easily understand how to use the big data and software developed for analytics over big data. They might find it a really complex area and adapt to it. I personally enjoy adapting myself and learning new technology as much as possible. However, there are some people to it's really quite a lot for them to learn and adapt to new joiners especially when we ask them to perform so many things in different software. So they get confused and they really find it difficult to learn how to use it.	DT-BDA PC-RC

25 I:	Do you think older auditors have more trouble using those new technlogies than the younger ones?	
26 P:	No, I disagree with that. From my experience, I had a feeling that more like older people in the company they find it more difficult to adapt but the thing is that they have more experience. So, it balances with experience. Since they have the experience, they might guess it more easily how to do it. For the technology, I think young ones are more into quickly learning how to use it but they might lack audit experience.	PC-RC
27 I:	Are blockchains something that incorporated in your auditing Department?	
28 P:	Not for me. I can't really answer that. Personally, I'm not too Involved.	DT-BDA DT-BCH
29 I:	Why are they no use in your audit department?	
30 P:	Well, they must be because we have this special team in consulting. But I'm not really into that and I can't truly give you those answers.	
31 I:	Could you mention may be some ways that you think blockchains would help you do your job?	
32 P:	I haven't really thought about it. So I'm not sure because this blockchain is really a new thing and I'm also not really familiar with it. I know like general thoughts but not really sure how it really works. So can't really say that if it will be beneficial for us	
33 I:	Are artificial intelligence and RPA as a robotic process automation something that in use from your auditing department?	
34 P:	Well, yes. From the audit perspective, we have processes that are automated and that is not performed by a human being and that is quite important and it is a really efficient way now. But in the clients as well, they had a lot of automated processes. It is really beneficial for us because then it's you know you have a high reliance on automated processes than on the manual processes. We find it more effective and efficient to work on automated process than manual because we rely on more. So, in our audit work, we have a lot of processes that are automated. We also use artificial intelligence, for example, we have AI bots when we ask something they help us like there's no human being behind but they're like the automated answers.	DT-AI DT-RPA
35 I:	Are AI and RPA something that you personally make use in your work	

	routine?	
36 P:	Yes, of course. We have different kinds of automated processes in work. For example, when we have some issues with different software and then we ask technical questions and we get automated answers or solutions and it's also really helpful. Another thing is that we want to make order something online, that it is also part of automated. There is nothing like we go and ask someone to order for us but it's like automated that you go and log in and then you order it. It can be requested for additional services for our client or some technical thing. We can also mention payroll system that we have and that's kind of also automated because we type everything like all the external expenses that we get reimbursed for and then we automatically get this a part of payroll. Also, we can say that the approval process is also automated when you want to recharge hours on every client and approve it. So, we can say we use them on a daily basis that we use automated processes. For example, taking data from one software to another and transferring. We don't do it manually but it's like automated as well.	DT-AI DT-RPA
37 I:	Ok. In what aspects do they help you to save your job?	
38 P:	For example, we have a software where we see what tasks are assigned to what person and then it is updated depending on work fulfillment, status. Then we get the reports from software where is the whole picture of our audit work. So, I think it's one of the benefits of this automated process because I don't manually prepare any report but it's like automatically rendered on the system. It's efficient and we easily control the process of audit. It's kind of big benefit as a manager as you get more control of the audits, team, tasks, and outstanding areas . Also, we have documents obtained from the clients and then we want to assign these documents to our work papers and it's also automated because once you create requests for the document it's automatically transferred to our work database where this has to be. So it's not also manually done and also really makes our life easier as an auditor. Since it's something that is automatically performed, basically it saves audit time . So, as benefits, it saves our time, it's an effective way of managing the project and an effective way to control the team as well.	PB-FE
39 I:	Do you think it has affected your job in any negative way?	
40 P:	No, I don't think. But the challenge may be informed about how to use it and as we have many systems and it's always new software coming and you always have to do some learning or workshops. Then we can say it's a challenge for us because then we have to spend time on it In today's world, there is nothing you learn a few years ago and you can use it but you have to learn every day. The negative effect can be that it needs time to adapt.	DT-AI DT-RPA

41 I:	For all those technologies from Big Data over to RPA, how familiar and confident do you feel using?	
42 P:	We can say a moderate level because not specialized in any. I'm just the end-user of it but it's something that we always mention and we always try to use on a daily basis but I'm not really highly confident talking or explaining with details all of them. I just basically understand their functions and how to use them.	
43 I:	I understand. But with which technology do you think you feel the most confident from those?	
44 P:	Since I'm using a lot of internally developed software that we use every day in PWC, I'm already used to it and it's easy for me to adapt to new functions of them. But when it comes to other technologies that I have never worked with, then I don't think it will be super easy for me to adapt. Because I really need to spend time and put so much effort in learning how to do things with new technologies.	
45 I:	Okay. Have you received any prior training on how to use those technologies either from your former education or from PWC?	
46 P:	Yes of course. When we start we always have workshops and trainings on how to use those new technologies. Once new software comes out and we have to implement in our work, then we always have learnings and also workshops on how to use it. So it's something that we regularly do and it's something that we every day learn. Because one workshop is not enough to really understand the software and how to use it. Therefore, we always need to work on it, experiment a little bit, and read guidelines. It always requires self-learning and also trainings. We have an outside educational digital center where we have all the new learnings, workshops, and online trainings. So, I always try to use that center when it comes to familiarizing myself with new software. If I don't have time and I need a specific question, I use those guidelines that show how to use it. So, that's also part of the self-learning process.	PB-CU
47 I:	Okay. How would you react if you were told that you need to start using those technologies more?	
48 P:	I really understand that it will be beneficial for us. Since it is a positive challenge and change, I would be happy to learn more and adapt to new technology that my work requires me to do. It's nothing that I will just be afraid of but I would be willing to learn.	PB-CU
49 I:	What are your feelings towards the digitalization of the auditing profession?	
50 P:	In general it's something that is happening now and will happen more in the future. Digitalization is an important aspect of the audit because our clients are digitalized so we had to be more digitalized in order to give	PC-RC

	them better quality service . In the future, we really have to work hard to adapt to a new environment and implement new software and get stuff more skilled and give them more training in order to be up-skilled and up to date . It's a really big part of our work and will be better as you see more advances in digitalization.	
51 I:	Okay. Are there any specific parts of your profession that you think they're most affected by digitalization?	
52 P:	No, I think it's overall effected in all aspects. Even in different departments in PWC, they are all affected because it's part of our daily routine. Overall, we all have to be up-to-date digitalized in every aspect no matter what kind of work we do.	
53 I:	Do you think that digitalization has added quality in the auditing process?	
54 P:	Yes of course. It's also part of our work to make sure that the software the clients are using is correct so it's also what we can rely on afterward. If we rely on technology they use and software they use, then we have a higher quality audit. Because then we can use our software to perform efficient work and we get more quality results such as reports.	PB-IAQ
55 I:	Can you specify more about like what's high quality for you?	
56 P:	Let's say when we have human intervention in the processes, specifically, in payments. When we know that the payment cannot be initiated by someone without any approval and then the technology or the software will not let the person making a payment without any approval. Then we know that there is less risk that there will be some fraudulent activity in payments when we are sure that the software won't want to allow a person to initiate a payment without approval. Rather than if it's paper-based, it always can be falsified. Also by using digitalization or digital technologies by our clients, then internal processes are more controlled than not having any technology at all and having the paper-based work.	PB-IR
57 I:	Do you think that digitalization has reduced the number of repetitive or boring tasks?	
58 P:	Yes. Many tasks are automated right now and we don't really have to repeat the same tasks as me. It has a positive effect on our work. For example, when we copy the database from one software to another, we don't have to copy each work paper but by clicking one and using one software we copy the whole database. So, it's a kind of fast process for us rather than copying one by one . One more example is that, when we manage a team and want to check the status of each team member, we don't have to ask them personally since we already have software that where you can see the status of work for each team as a whole picture. can say maybe while	PB-FE

59 I:	Do you think like digitalization, in general, has changed the reputation or the profile of our audit profession?	
60 P:	Of course that's something we also discussed internally and it's also wonderful our goals as PWC could be more digitalized. It's a goal to be more upscale. Some tasks that we did like previous years manually but now they are replaced by software so it's also in the future we expect that these things we do now as in human beings will be replaced by technology. We also have to adapt to that and go in another direction in auditing and let the technology do what they can do. So, we are humans who don't do the robotic tasks that we might be doing right now.	PB-ARG
61 I:	I: How do you envision digitalization's future impact on your field?	
62 P:	Some tasks we are doing now will be replaced and will be done by Software. Then we have to find this as an opportunity to develop in different areas and not stay at the same level. As digitalization happens for our clients and regionally, we see more benefits and more opportunities we have to find. So, it's also one way to develop more and to be more accepting of digital software and perform different quality or higher quality but different ways of service to our clients.	
63 I:	Well. Do you think it's going to be more prevalent in the future than it is now?	
64 P:	Yes because now we can't say that all our clients are digitalized and they're today using super up-to-date software but they are also changing their environment. We also have to change and it will be more and more digitalized in the future. We also have to be more responsive and adaptive to that.	
65 I:	Okay and what do you think is or will be the impact of digitalization on the number of auditors required to be employed?	
66 P:	I guess if we implement more technology and if we substitute stuff with technology, then of course logically it will require fewer auditors. However, if we find an opportunity to develop another way we can use that stuff to be specialized in different or complex areas that technology can offer. So it's something that is probably under question and we can't be certain if technology will directly affect the number of auditors. I think it can positively affect resulting in different types of professionals or generating different areas to work with. So, maybe the number of auditors will be reduced but different professionals or maybe we won't do the same task and we will be doing different tasks but we can call ourselves auditors.	PC-NAP
67 I:	Okay then how satisfied would you say you are about digitalization's im-	

	pact on your job and why?	
68:	Yeah it's a really positive thing that is happening right now and I find it really beneficial for me to use different digital software. So, I don't think that it's a kind of heavy thing or proposes a negative effect on me. I'm quite satisfied and willing to be more digitalized.	
69 I:	What do you think are the benefits, opportunities, and risks that you think digitalization will bring on auditing or already exist?	
70 P:	Of course, it will be it will give us a chance to be efficient and effective in our work. So, it will allow us to have a look at the clients' business differently to analyze the data that we can give some solutions and give some advice on different business processes. Risks could be that the task that we are doing right now will be done by technology and for some people, it will be complex and they won't be able to adapt. So, not everyone can learn that fast how to use technology or software. It will be one of the riskier effects we will need to filter the people that can't adapt to any new environment .	PC-RC
71 I:	And do you think the skills or requirements to be an auditor are going to change in the future?	
72 P:	Of course, that will be changed because in the future some tasks might be substituted by technology that we don't really need to have that skill to complete automated tasks. But then we also have to be skilled in some different areas that we can really provide quality work and service to our clients. Also, that's one of our requirements to be up to date and it will be more in the future differently because the client always expects us to be well skilled. As we will have more advanced and more complex software to use in our daily work, we will have less paperwork and definitely more pieces of training on how to use this modern software. Probably, we will have different teams according to different IT software that will be specialized in one software because it would be complex to adapt to all technologies that the company develops. So we will be more IT oriented and maybe we'll have new services for the client that is more IT-oriented because they will require from us.	PC-NAP
73 I:	Okay and as a final question do you think it's harder or easier to be an auditor now than in the past and why?	
74 P:	I think it's easier. We have more opportunities, flexibility in work by using modern technology. It might be difficult for some to adapt but if once you are adapting to it and know how to use it, you are definitely more effective in your work. Now you have the opportunity to be more flexible and more effective in your work, spending less time on some automated work or manual work and spend time more on essential analytics rather than doing some technical stuff. It is also easier to learn nowadays since we have many online resources for self-improvement.	PB-FE PC-RC

75 I:	Do you think your customers are the prime driver for digitalization?	
76 P:	Yes, absolutely. Why do we want to be more efficient and effective because then we are performing higher quality work and then clients can trust us more.	PB-REG
77 I:	Would be alright with you if we contact you in case any information or clarification is needed?	
78 P:	Sure.	
79 I:	Okay. Would you like to receive a copy of the study once it has been published?	
80 P:	Yes, sure.	
81 I:	Okay and is there anything you would like to ask us?	
82 P:	No, I don't think so.	
83 I:	Okay thank you very much for some insights and your time.	
84 P:	Okay, good luck.	

Appendix 7 Interview transcript – P7

Company: PwC
Interviewee: Participant 7
Work title: Risk and advisory consultant
Date and Time: April 22nd 2020

Line	Transcript	Code
1 I:	First of all as we have already stated our thesis is about investigating the effects of digitalization on auditing. The study particularly investigates the benefits and challenges of digitalization for this position. I would like to assure you that there are no right or wrong answers, we are only after honest opinions. Also, your participation is anonymous we are not going to use your name at any point in the interview we will just mention company names like five guys from Deloitte, five guys from KPMG, and here are our findings.	
2 P:	Okay, that is fine.	
3 I:	You also will have the capability or the ability to revise the transcript and to modify any of your answers at any point. If you feel like you forgot something or something you stated you want to check. Do you have any questions before we start the interview?	
4 P:	Not so far.	
5 I:	So first of all what is your working and educational background?	
6 P:	Yeah so my educational background, I studied the information systems at Lund University the bachelor program for three years and after that, I studied the master's program as well, the one-year master program where I found business intelligence, data management, and risk management the most inciting and exciting areas. Now I work as a risk and advisory consultant at PwC. I've been there now for two-three years and we are part of the financial audit team with IT audits. and the data and analytics. So, I'm a senior right now that basically means that I'm a contact person for both the financial or the team and the client and I'm also a coach for the new members of our group. My responsibilities in the auditing process are basically planning the audit and conducting the audit and reporting to audit and coaching the new members. from on the team and how long	
7 I:	How would you describe your relationship with computers and technology?	

8 P:	Yeah I think it's quite advanced level and I have no trouble with working digitally now.	
9 I:	How would you define digitalization?	
10 P:	Yeah I would define it as when processes go more digital and because certain activities get digitized and they are performed digitally instead of physically and when it comes to digitalization it's more a whole process that goes digital. The phrase digital journey and digital transformation are becoming such and such. There are common phrases like digitizing which businesses use when a single process or operation becomes digital. However, our businesses are not only digitizing now, but they are also digitalizing right that they're moving whole processes to be digital instead of just using you know word instead of paper	DT
11 I:	Okay and could you name some technologies associated with digitalization in your field or outside of it?	
12 P:	Sure. we use AI-enabled technologies and AI is, of course, one way of achieving digitalization. We have of course Big Data is it's more product of it than it is a digitalization technique and we have the extract, transfer, and load or ETL and processes that work with big data. So, these are the techniques that have become more and more prominent now with access to big data lakes and everything.	DT
13 I:	Let's move into big data and analytics. Are big data and analytics something that is used in your department in auditing.	
14 P:	We are not using it right now because big data for me is when you have access to to a big data lake and you have a lot of different sources and that contribute data to this lake and then you basically extract, transform and load to get the data into a state where you can analyze it and drive some kind of conclusions from it. When we are auditing, we're auditing the financial data, financial or going into the trial balance to check the risk, income statement, and balance sheet. By going through it, we check trustworthiness the numbers that come from the financial systems that are basically ERP systems. The ERP system, in turn, uses big data that system can be built on a data lake or getting their information through an ETL process. However, when we are auditing, we are auditing the structured data from the financial system an do not perform ETL processes round it. We are performing data analytics on the financial data but I would not call that big data and analytics because it's already in a comprised or summarized form, not like raw data that is the consisting of hundreds of sources	
15 I:	Okay. Why do you think that you are not using big data in such a way?	
16 P:	When we're doing the audit, we are focusing on financial data and that is already not in a big data state maybe it once was. If we are going to audit	

	big data, we would probably need to focus more on the extract, transform and load processes around it and that is not something that is incorporated in the audit process right now. It's more focused on the comprised financial data that is already in the ERP systems and for me, that's not big data just comprised data that once was big data.	
17 I:	Are big data analytics something that is of use in your auditing department?	
18 P:	We perform data analytics in a way that is similar to Big Data and I think it has the same methods of going through data quality problems. When we collect financial data from the ERP system, these are financial data in comprised form. However, they are still not in a matched form and they are not perfect in terms of quality. When we receive these extracts, we use some techniques regarding cleaning the data that is a very important step in any big data analytics. Before we can analyze data, we really need to clean the data. I think here is when the big data analytics part kinda is done and it's over. Then the data is ready for analyzing which is the second part and I think here the process is kind of merged and they are quite the same. Basically, we have the ready clean data and we try to recreate and flow from that is similar to the real flow. For example, the inventory analysis for some company's inventory and it can be very important for them to understand these figures are correct or can we trust it and that's when we do the inventory analysis. We basically go through the inventory value list, we look at all the inventory transactions for each article and we look at purchase orders and customer orders to see ok what we can trust. So we kind of recreate the real flow with the data that we get from the systems to check if it matches the reality can we trust the numbers. So, when comparing it to big data analytics, the cleaning process is similar but it's not the same because we do not have the same complex data sets or raw data. When it comes to analyzing it, it's summarized and compromised form I think it's quite similar.	DT-BDA
19 I:	Could you say some aspects that big data and analytics help you do your job well?	
20 P:	Yeah, for sure. I think when it comes to automating controls which is an audit process. The control-based audit is when we trust the controls of the business that we are auditing and because we have tested them and we have said that they work. As controls work, we can trust the financial numbers that the audit is building upon. Big data and business intelligence can support control automation if you have data like where data is clean and usable. Then you can automate controls hat based on data that goes through the lake and different alerts are sent out for to people that need to see them, certain risks are highlighted within or from the data . Businesses are getting more used to automated controls. So, I think it's important to understand how mature the client is and when it comes to IT and how mature they are when using big data analytics. If a client is more mature in in these kinds of steps then the audit can adapt to it and we can also, make use of their big data controls and we can very much the end	PB-IAQ

	certify that they are working correctly and then we can trust them.	
21 I:	Can you imagine a scenario that you think the implementation would negatively affect your job?	
22 P:	I'm a fan of Big Data I think it's I think it should be implemented more and automating. We can rely upon automated controls more that we can use our understanding of the controls to be better advisers. So, I don't know if I can see any negative impact from it. Certain tasks will certainly disappear and certain audit processes will certainly disappear and if there are people that are not willing to adapt, they would get affected. For me, it's a good thing and I think it's a chance to adapt more.	PC-RC
23 I:	Are blockchains something that incorporated in your auditing department?	
24 P:	Yeah, when it comes to blockchains, we know about them. It's not something that we use in our auditing process, we are mainly advising around them right. I don't think that a lot of different businesses right now fully committed to the blockchain. We're not using it right now because the clients are not there. We have to understand what the blockchain and what it is to the better auditor with it. Blockchain is basically a general ledger and they would need to use this as a general ledger for us to be able to audit it. If they're not using it, what we can do is maybe if we could try to build the general ledger to encourage it. But I don't think that's our role in the market. There are tech companies that do that better. I think we are with more advising around the blockchain how to use it than to actually build it.	DT DT-BCH
25 I:	I won't ask you if you use it in your work routine since it's obvious you are not. I will go ahead and ask you can you mention some ways that you think they could help do your job personally?	
26 P:	Yeah, for sure. I think it's the same as for the big data since blockchain would make going through the financial data so much easier, since it would be validated in a way that we don't need to validate it anymore. It would be financial data from the general ledger that would already be validated. It would already be safe to use or if you can rely upon the IT controls around it. It would take away a lot of substantive testing. When it comes to audit approaches, you have the control based testing and you have the substantive based or sample testing which is basically when you take samples from a process to verify that it works according to the design of the process. With blockchains you only need to focus on the control based testing, then you only need to verify that the controls around the different processes. So I think that the blockchain would kind of remove the sample testing and control testing would be more prominent and important. Control testing it would be generally IT controls that would be need to function because the blockchain is built on the supporting IT infrastructure of a business. To summarize, it would remove the substantive based testing because we would rely upon the blockchain as	DT-BCH

	it is validating itself and secondly, it would improve the control based testing that's more fun personally.	
27 I:	Okay. Could you mention a scenario where you think that implementing blockchain would negatively affect your job?	
28 P:	Yeah, for sure. I think the one positive thing with blockchain is the validating part and that could also become the negative thing when people have so much trust that it's completely safe. I mean there are cases of fraud when blockchain has been used. For example, it's when people have hacked into the community and you still think that is safe but there's actually fraud being committed. As the auditor, you kind of trust the blockchain completely and you do not try to validate the IT control because you have gone from substantive testing and then you can miss a lot of potential frauds that would be devastating for an auditing business.	PB-IR DT-BCH
29 I:	Okay. Moving towards Artificial Intelligence (AI) and Robotic Process Automation (RPA). Are they something that used in your auditing department?	
30 P:	Yes, they're used quite frequently. If we start with RPA and we're using it internally quite much to prepare our audits. We always have a database for for each year and each client and there's a lot of manual labor going into preparing these databases. There are a lot of documents to be going into the database and a lot now in the text. These kinds of stuff that robotic process automation is perfect for. So our RPA is basically being used to prepare databases right now and handling documents. RPA is best used for tasks that do not require more than one second. RPA is used to prepare databases by copying in different texts and different materials.	DT-RPA
31 I:	Is RPA and AI something that you personally make use in your work routine?	
32 P:	Yep, I use. I both develop RPA solutions and I use AI-based analytics platforms when analyzing the financial data.	
33 I:	How often would you say that AI and RPA are of relevance in your weekly work routine?	
34 P:	Right now, it's becoming daily. I just want to give you an example of when both used together and when it's combined. We have an SAP system where data is generally the same and standardized way. It is perfect for RPA to extract the data from these systems. So, RPA prepares the data in a way that matches our data model. Basically when performing the analysis, it prepares the data according to the data model. After data is structured, it is loaded into an AI platform that finds outliers.	DT-RPA DT-AI

35 I:	Okay, and in what aspects do they help you do your job?	
36 P:	Yeah, if I take the same example, I would be the one preparing the data and putting the parameters into to see what outliers we can identify in the analysis. So, it removes a lot of manual activities that I otherwise I would perform. So, it saves a lot of time for us.	PB-FE DT-AI DT-RPA
37 I:	And do you think they have affected your job negatively in any way?	
38 P:	Yeah, these are the hardest questions but of course there's a lot of negativity in it. If we look at data, it's always, of course, the risk of bias in data. If the data that we analyze is bias in any way and then the artificial intelligence platform would basically have difficulty in finding the real outliers. For example, If I manipulated data, it would not find any outliers and show that this is fine and you don't need to further investigate. Also, auditors have to have their interpretation of technology that they can understand the artificial intelligence platform just did or other technologies. It takes away a lot of understanding of the background processes and makes us trust it in a way that it's performing its jobs and tasks that we kind of have blind faith for it. Everyone needs to be aware of when working with these kinds of technologies and especially when it comes to financial auditors that do not have an IT background. When the platform has performed its analysis, it provides them with the results but if the data was biased from the beginning and the results are incorrect and you're using incorrect results for your audit but you don't maybe know if the data was biased because you trust everything and have no knowledge how the platform came into these results. It requires an auditor to gain that basic understanding in other ways so you need to adapt and kind of understand what you're doing.	DT-AI DT-RPA PC-NAP
39 I:	What are your feelings towards digitalization in your profession?	
40 P:	I think it's great and it's something that we need to accept and adapt to. I think it puts pressure on us to be more digitally enabled and digitally understanding but for me personally, I think it's an opportunity for us to become these digitally-enabled auditors.	
41 I:	Okay and did you receive any prior training on how to use them from the former education or your workplace?	
42 P:	Yeah a little bit coding. When it comes to different languages and if we would say AI as an example you mainly code right now in P from and Python right and but what I was taught in school or the the educational platform was more different languages like C sharp and in Java. When it	

	comes to the work profession, we don't have that many coding classes since it's not a must for the financial auditors to be able to understand code. When it comes to my work and how they have prepared us for these kinds of technologies, it's moving okay and it's the opportunity but I don't think that everyone is taking it.	PB-CU
43 I:	Okay. Have you tried further to familiarize yourself with those technologies by yourself?	
44 P:	Yeah, definitely. I had a project I'm working on at home that involves both RPA and some sort of big data analytics. So, I'm having my small projects where I try to work with these technologies.	PB-CU
45 I:	Do you think that you need to be programmers like to know to code?	
46 P:	Nope. I think it's important for the audit team to have the competence but for the financial auditor to have to understand coding and programming is not a must.	
47 I:	Okay, and how would you react if we let's say your company informed you that you have to start using all those technologies more, more incorporated in your job?	
48 P:	That would be great. I'm trying to use more and more and we have a sort of innovation workshop that we perform at our office that I'm a part of. These are some initiatives where we try to see what problems we have and how we can do better and are there any technologies that can help us achieve this. So, I would be thrilled personally. I think we have some interesting things actually that comes up from the list where we can use these technologies more and provide a more digital audit from start the beginning from start to end.	PB-CU
49 I:	Okay. Are there any specific parts of your profession that you think they're most affected by digitalization?	
50 P:	It is the main or basic tasks the basic that are most affected now. Then when I look into the future I think we will have a fully digital process where we have a platform that is provided by PwC need or KPMG or EY and clients kind of just upload data and information and then the machine is doing everything that we do right now and then you get the auditing result and then that's what is discussed with the client by the auditors instead of the basic tasks that we're doing as of now or starting to not to do now due to automation.	
51 I:	Would you say or do you think that digitalization has added quality in auditing?	
52 P:	Yes, definitely.	

53 I:	And what ways or which cases?	
54 P:	When it comes to speed and how fast we can deliver insights to the client that we are auditing and it is a quality measure. Also, it eliminates human error.	PB-IAQ
55 I:	Okay. Do you think that digitalization has reduced the number of repetitive or boring tasks?	
56 P:	RPA does it when it comes to preparing the audit databases and which is something that needs to be done every year. There are a lot of different tasks that are being removed when it comes to preparing data sets for analysis. We have SAP right now which is a more standardized system and otherwise, I would be still doing a lot of quality checks in data.	PB-FE
57 I:	How do you envision digitalization's future impact on your field? What changes will it bring you?	
58 P:	We will have auditing robots that are the future where we're working towards.	
59 I:	Can you elaborate a bit on this?	
60 P:	Yeah, when it comes to business is becoming more IT mature, they will adopt these technologies that we have been discussing more and more. I think among the ones that we have discussed today big data analytics is the one where clients have advanced the most and when it comes to blockchain I think it's still something that is not fully used or perceived as trustworthy in auditing. When it comes to AI and the RPA I think there are a lot of businesses standing in and using them right now. And when it comes to us we, of course, go through the same journey as we discussed with us preparing databases and data projects and since it would be robots performing the processes within the businesses and it would be robots performing more and more auditing. So, auditing robots will be more prevalent in the future, than it is now. I think it will increase exponentially.	PC-NAP
61 I:	Okay and what do you think is or will be the impact of digitalization on the number of auditors required to be employed?	
62 P:	Auditors today will not be hired in the future since there would be different requirements for the auditors. But as long as society and education adapt to preparing auditors for the new reality, then auditors will have different tasks than they have today.	PC-NAP
63 I:	But will the number increase or decrease or stay the same? What is your view?	

64 P:	Stay the same.	
65 I:	How satisfied are you personally with digitalization upon auditing by now?	
66 P:	Yeah, I think it's moving in the right direction definitely and I'm satisfied and I hope it will increase more.	
67 I:	Why is that?	
68 P:	That we can both be better or have more time on our hands when we work in high seasons with different financial reports that need to be audited. So, having more and more automation from either RPA, AI or big data-enabled automation or blockchain validation all of this will help us in these seasons to be to have higher quality on what we do and it will allow us to be quicker and it will allow us to to get better insights as well. Then we can kind of adapt ourselves to becoming more advisors than auditors.	
69 I:	Do you think that is is it harder or easier to be an auditor now than it was in the past?	
70 P:	For me, it's easier but in general it's harder because when it comes to technology, it moves exponentially. You have a lot of auditors today that maybe don't want to recognize that and you have a lot of auditors on the other side that likes it and they want to understand these digital transformation journeys that a lot of businesses are performing right now. There's always gonna be some and some auditors that think it's more difficult with this digital transformation that is happening.	PC-NAP
71 I:	Do you think that the skills or requirements to be an auditor are going to change in the future?	
72 P:	I think it will become more and more important to understand automation and not rely upon automation solely and to be critical of automation. I think it will be a new skill that needs to be adopted. It will be required to see the risks to that automation is just not only providing answers it also needs to be controlled because if any automation is wrong then every result from it will be wrong.	PB-IAQ
73 I:	Don't you think that auditors from now on need to be more computer savvy?	
74 P:	Yeah, I think that they will be. Everyone is especially during these times when you're kind of forced to work digitally and every company right will come out from this more digital-savvy or more computer savvy. It kinda makes it easier in the end to be an auditor when the auditing process will be more and more automated and you will rely upon technologies and automation. Of course, we will have to understand more about	PC-NAP

		how automation works and to be more computer savvy.	
75 I:		Would be alright with you if we contact you in case any information or clarification is needed?	
76 P:		Yes, of course.	
77 I:		Okay. Would you like to receive a copy of the study once it has been published?	
78 P:		Yes, sure, that would be very interesting.	
79 I:		Okay and is there anything you would like to ask us?	
80 P:		No, I don't think so. Who should I send this recording to?	
81 I:		Okay that was the other thing I want to ask you is if you can send us the recording but do you need any help with that or do you know?	
82 P:		Well, I think it is automatically saved somewhere and then I can send it.	
83 I:		Okay thank you very much for some insights and your time.	
84 P:		Okay, good I hope this was helpful.	
85 I:		So thank you for your participation.	
86 P:		Thank you!	

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