The Impact of Automation on the Work of Accounting Professionals

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Degree programme International Business	
Thesis title The Impact of Automation on the Work of Accounting Professionals	**Number of pages and attachment pages** **29 + 1**

The aim of this thesis is to research the impact automation has on the work of accountants. Automation is one of the biggest current trends and is expected to have a significant impact on the work of many professions, including accountants. Therefore, it is researched how the work of accountants has changed in the recent years and how it is expected to change in the future.

Automation in accounting has increased in the past years. Tasks that require manual data entry or are repetitive are most likely to be automated. Automated processes can lead to an increase in quality, efficiency and productivity. However, the number of accountants can decrease and the required skills for the job change. Moreover, investing in automation requires monetary resources that smaller companies might not have. Automation can be done with several concepts ranging from cloud-based accounting and software as a service to artificial intelligence and robotic process automation and blockchain.

The research method chosen was a qualitative approach in the form of interviews. The interviews gathered data regarding recent and upcoming changes in accountants' work as well as how these changes affect accountants' tasks, competencies and workload. Based on this, recommendations were made.

The results of the research indicate that most changes in accountants' work are related to manual tasks, such as accounts payable and accounts receivable. The most commonly used forms of automation are cloud-based accounting and software as a service as well as robotic process automation and artificial intelligence. The increase of automation has an impact on accountants' work. The tasks have changed and the focus has changed towards analysing and advising. There is an increase in efficiency and productivity. Nevertheless, some challenges are faced to due automation, related to technological issues and people. Moreover, technological and interpersonal skills have become more important.

Keywords
Automation, Automated Accounting, Accounting, Accounting Competencies, Accounting Workflow

Table of contents

1   Introduction

This is a bachelor's thesis for the Degree Programme in International Business. It discusses the impacts of automation on accountants' work.

The first chapter contains the basic information about the thesis. It introduces the background of the thesis, the research question as well as the investigative questions. Moreover, the topic's demarcation and international aspect are presented. The benefits of the thesis are discussed and the key concepts are also defined in this chapter.

1.1   Background

Technology and its advancements have always had an impact on the work of people. One of the current megatrends is automation which allows software and machines to substitute human labour. According to EY (2015, 13), almost half of the professions are at risk of being automated within the next 20 years. The impact of automation is mostly centred on routine and repetitive tasks. (EY 2015, 4, 13.)

In the accounting industry it is frequently feared that humans will be replaced by robots which is not entirely true. The decrease of manual tasks is predicted to change the job of accountants to an adviser and analytical role. However, automation also creates new opportunities and is said to improve quality and accuracy of accounting information. (Forbes 2018; EY 2015, 13.)

This thesis explores the impact of automation on the work of accountants. It takes a closer look at the changes of the past 5 years and how accountants' work might be altered in the future as well.

1.2   Research question

The goal of the thesis is to research the impact automation has on accounting professionals' work. The research looks into recent and upcoming changes and shows how accountants' tasks, competencies and workload are affected by automation. It provides information that benefits companies through the recommendations whether there are training needs for the employees.

The research question can be worded as: What is the impact of automation on the work of accounting professionals?

The investigative questions (IQ) are the following:

IQ 1. What are the recent changes?

IQ 2. What are the anticipated upcoming changes?

IQ 3. How do those changes affect accountants' tasks?

IQ 4. How do those changes affect accountants' competencies?

IQ 5. How do those changes affect accountants' workload?

IQ 6. What recommendations can be made?

Table 1 below shows the theoretical framework, research methods and chapters in which the results for each investigative question can be found.

Table 1. Overlay matrix

Investigative question	Theoretical Framework	Research Methods	Results (chapter)
IQ 1. What are the recent changes?	Automation, accounting	Qualitative (interview)	4.1
IQ 2. What are the anticipated upcoming changes?	Automation, accounting	Qualitative (interview)	4.2
IQ 3. How do those changes affect accountants' tasks?	Automation, accounting, accounting workflow	Qualitative (interview)	4.3
IQ 4. How do those changes affect accountants' competencies?	Automation, accounting, accounting workflow, accounting competencies	Qualitative (interview)	4.4
IQ 5. How do those changes affect accountants' workload?	Automation, accounting, accounting workflow	Qualitative (interview)	4.5
IQ 6. What recommendations can be made?	Automation, accounting, accounting workflow, accounting competencies	Analysing IQ 1-5	4.6

1.3 Demarcation

The research of this thesis focuses only on accounting firms and their accountants. Accounting firms are presumed to adapt new technologies faster and the impacts of automation can be better observed there. It is more likely to receive a reasonable amount of respondents from accounting firms. Moreover, the research considers only the impacts of automation that occurred in the past 5 years and the anticipated changes of the future. The research is focused only on the tasks, competencies and workload of accountants, since it is sufficient to provide a clear picture of the impact of automation on accountants' work.

The research does not include accountants of companies' in-house accounting departments due to the difficulty of receiving enough respondents. In-house accounting departments are possibly slower at adapting new technologies and as this thesis does not aim to compare the changes in accounting firms to those in in-house accounting departments, the in-house accounting departments are excluded. Furthermore, changes because of automation that happened more than 5 years ago are not considered. The only considered areas of accountants' work are tasks, competencies and workload. All other areas are excluded from the research.

1.4 International aspect

The researched topic is of international nature, since automation is a current and international occurrence, that affects the work of accountants. Therefore, the outcome of the research in this thesis can be used internationally.

1.5 Benefits

The research in this thesis is beneficial for the accounting industry and accounting firms since it provides insight into a current and important phenomenon. Furthermore, accounting firms benefit by finding out how their employees' work is affected by automation and how they can keep up with the changes.

The author of the thesis benefits by gaining knowledge of a current topic in accounting and learning about the skills needed to be successful in the accounting field with the changes due to automation.

1.6 Key concepts

Automated accounting refers to the reduction of manual work in accounting because of digitalisation by using software, machine learning and artificial intelligence. Automated accounting allows keeping up to date records and simplifying data entry. It increases efficiency while reducing human error. (Scalefactor 2018.)

Automation is the usage of computers or machines that can operate without the control of human beings and therefore substitute human labour (Cambridge dictionary 2019).

Accounting refers to recording, analysing and reporting financial and business transactions of companies (Merriam Webster 2019a).

Accounting workflow is a chain of planned and repeatable tasks that are done. It exists in every company and work and focuses on the bigger picture of the job. The workflow may change because of the use of new technologies and tools. (O'Bannon 2013, 31.)

Accounting competencies refer to having the required skills and knowledge in order to perform a certain task or job (Merriam Webster 2019b). In the accounting field, the competencies are related to reporting the results of the work, data analysis and interpretation, risk management, research of frameworks and standards as well as the ability to use technology and tools. (AICPA 2019).

2   Automation in accounting

This chapter provides details about the theoretical framework of the thesis. It introduces and explains the key concepts.

Figure 1 below shows the relevant key concepts for this thesis. The theoretical framework consists of three parts: automated accounting, accounting workflow and competencies. First, automated accounting is discussed, followed by accounting workflow and competencies.
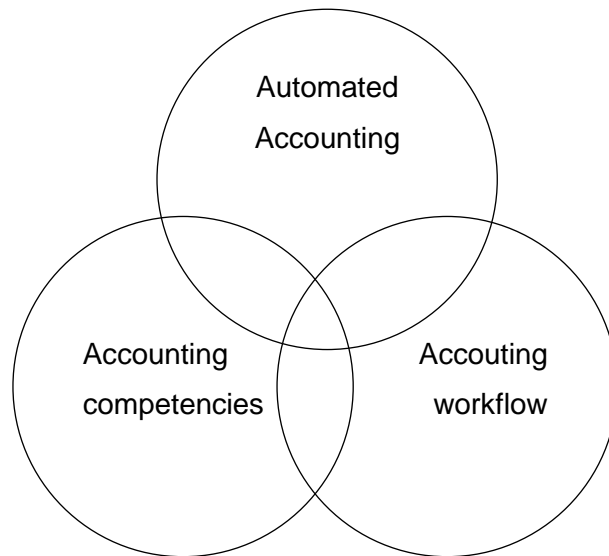
Figure 1. Key concepts

2.1   Automated accounting

Automated accounting is defined as the reduction of manual work in the accounting field because of digitalisation by using software, machine learning and artificial intelligence instead of human labour (Scalefactor 2018).

Digitalisation and automation have had an impact on many industries in the 20th century. In the field of accounting, computer systems started to be used since the 1970s for routine tasks, such as payroll and invoicing. This allowed companies to decrease costs of those tasks. The automation of tasks related to payroll, audits and tax preparation is often said to be the biggest transformation of accounting since the introduction of double entry bookkeeping in the 16th century (Forbes 2018). However, tasks such as insolvency that

required human judgement and interpersonal contact were considered more difficult to digitalise. According to Wilson & Sangster (1992, 65-66), the use of computers in accounting would decrease the overall cost of financial information because it increases productivity. Nevertheless, productivity is not the most important factor when it comes to digitalisation of accounting. The quality of the work is still more important since it also influences decisions that are made. Wilson & Sangster (1992, 68) state that change is demanded by customers and their wish for decreasing costs, meeting performance targets and the introduction of new services. Moreover, research conducted by Wilson & Sangster (1992, 73) shows that accountants themselves considered an increase of productivity, improved quality of the provided services and the possibility to finish tasks in less time as the motivating factors of automation. Nonetheless, Wilson & Sangster (1992, 68) also consider the constrictions for automation. The main constraint is the type of the work meaning that some tasks are easier to automate than others. Furthermore, the size of the company is expected to have an impact on the speed of the introduction of new technologies. Bigger corporations have more funds available that can be invested in new IT systems. Another issue is considered to be the required skills of accountants in order to use new systems effectively. (Wilson & Sangster 1992, 68-72.)

Nowadays, digital tools are widely used in the accounting industry. Accounting processes are mostly paperless and many accounting firms use Enterprise Resource Planning (ERP) systems. Automation has an impact on the communication with the customers as well as the accounting work itself. Technologies, such as artificial intelligence (AI), blockchain and cloud-based accounting, are entering the accounting industry but also affect accounting firm's clients who also start using these systems. These technologies are said to reduce manual data entry and to improve the quality and accuracy of data. Some fear that in the future accountants are going to be replaced by machines or robots. However, several researchers argue with this and instead state that machines working alongside humans are going to be most successful in the future (Deloitte Middle East 2018; EY 2016, 10; Forbes 2018.) Nevertheless, Deloitte Middle East (2018) estimates that around 50% of back office jobs are going to be automated in the future and therefore become obsolete. Nonetheless, PWC (2018) states that the companies that predict employee reductions due to automation decreased from 27% in 2016 to 19% in 2017. However, a total of 89% expect employee reductions, either marginally or in the medium term. Moreover, different skills are becoming more important to keep up with increasing automation. (Deloitte Middle East 2018.) A pro-active approach from the industry is crucial as well. (Malaescu & Avram 2018, 5; PWC 2018, 7 & 28.)

Tasks that are most likely to be automated or are already automated are repetitive tasks, such as manual data entries, account reconciliations, journals, accounts payable, travel claims, intercompany transactions, transaction matching, invoicing and period closing. Accountants must then only deal with handling exceptions. (Brands & Smith 2016, 70; Parcells 2016, 43-44.)

According to Forbes (2018), automation brings the chance for accountants to develop into value adding business advisers and analysts. Accountants can then focus on performing more value adding, analytical and strategic tasks which in turn might increase their job satisfaction. Automation is expected to enable accountants to improve the competencies of robots through their knowledge. However, accountants need to develop their skills in order to adapt to the change that automation brings. (Deloitte Middle East 2018; Parcells 2016, 45.) According to research by EY (2016, 9), 60% of respondents stated that their main focus in the future regarding automation is to increase cost efficiency as well as the company's growth. Moreover, 65% of their respondents consider automation to be focused on in order to improve the finance function (EY 2016, 3 & 9).

Table 2 below shows the benefits and downside of automation as stated in the literature and discussed above.

Table 2. Benefits and downsides of automation according to literature

Benefits of automation	Downsides of automation
More efficiency	Less people needed -> less jobs available
Cost reduction	Different skills will be needed
Increase of quality	Monetary resources to invest
More transparency in reporting	
Increase of productivity	
Time for other tasks -> increase of job satisfaction	

Even though algorithms are becoming more efficient at collecting and compiling big data, they are not able to replace humans completely since machines are lacking common sense. Tasks that require planning and decision making as well as specialized expertise are still considered to be the most difficult to automate. Therefore, technology allows accountants to receive easier access to better data but the information need to be applied using business insights and intelligence which are considered to be human traits. Moreover, humans have an understanding of context, business culture as well as the history of the business which are important for the development of strategies and the use of proper accounting principles. Humans are also needed to analyse that data that is collected by

robots. Consequently, the right people with the right skills are crucial regarding the automation of accounting. (Brands & Smith 2016, 71; EY 2016, 3 & 10; Forbes 2018.)

KPMG's (2017, 15) research among German companies discovered that the changes of digitalisation that occurred up to 2017 are mostly related to the improvement of the quality of data, speed of reporting, the expansion of services as well as the focus on processes. Changes in employee competencies and cost reduction are considered to be partly affected by digitalisation, whereas outsourcing of tasks and a decreasing number of accountant staff are least impacted by digitalisation. Changes of the following two years up to 2019 were anticipated to be a further increase of data quality, focus on processes, reporting speed and changes of employee competencies. Outsourcing of tasks and a reduction of accounting staff were still considered to be least likely to happen in the future. The biggest change between the state in 2017 and the outlook to 2019 is a 24% increase of the expected likelihood that employee's qualifications will change and move more towards IT skills. (KPMG 2017, 15-17.)

Research by PWC, discussed in Ilcus (2018, 355) discovered that in 2018 approximately 22% of German companies used AI and another 25% were planning to implement AI in the future. Furthermore, the same research found out that 60% of the participants in the survey agreed that AI will have a big impact on the work of accountants. The benefits of automation are said to be reduced costs through eliminating paper and printing, better control over, e.g. invoices, easier to archive and, therefore meet legal requirements regarding archive obligations and faster processes. (Ilcus 2018, 355.)

According to Malaescu & Avram (2018), the use of new technologies in accounting, especially cloud computing, differs between different countries. In 2014, 51% of Finnish companies and 40% of Italian companies used cloud computing. However, Romanian companies' usage of these technologies was 5%. Nonetheless, research shows that 91% of the research participants in Romania are of a favourable opinion towards cloud-based accounting technologies. (Malaescu & Avram 2018.)

2.1.1 Cloud & software as a service

Cloud computing and software as a service (SaaS) refer to performing business over the internet without the need to install software since software applications are offered as a service through the internet. Cloud accounting means that accounting services are provided through the use of cloud computing which is the case with for example NetSuite and Waveaccounting. With cloud computing and SaaS it is possible to access financial data from anywhere at any time. It is a method to share software and databases or information.

Benefits of cloud computing are easy data synchronisation, speed and minimization of the risk of data loss. Using SaaS applications also leads to decreased costs since the company only pays for what they need. Nevertheless, Malaescu & Avram (2018) state that users do not have enough confidence in data security which has a negative impact on the implementation of cloud computing. Moreover, a stable internet connection is required for this service which might be problematic depending on the country. In the European Union the biggest constraints of implementing cloud accounting are considered to be the fear of security risks, high costs as well as the lack of knowledge about cloud computing. Especially in cloud accounting another obstacle is the risk of unauthorised access to the data. According to EY (2016, 10), the use of cloud accounting and SaaS is growing fast globally and increased by approximately 40% between 2012 and 2013. However, small companies might also not have enough funds to invest in cloud-based accounting technologies regardless of their willingness to adapt new technologies in their operations. (Dickey, Blanke & Seaton 2019; Dimitriu & Matei 2014, 841-844; EY 2016, 10; Forbes 2018, Malaescu & Avram 2018, 7-9.)

2.1.2 Artificial intelligence & machine learning

Artificial intelligence (AI) and machine learning allow accountants to have better access to real time information coming from a number of sources (Forbes 2018). AI is software algorithms that can perform tasks that usually require human intelligence, such as speech recognition and decision making. Machine learning is a subarea of AI. It comes from the idea that machines could be taught to learn in similar way as humans. Machine learning can be found in spam filters for e-mails, news feeds as well as targeted advertising. Machines are programmed to analyse data, understand pattern and create predictions. They are programmed in such a way that they learn from the analysed data and therefore, the learning is automated and continuous. It is most suitable for repetitive tasks and analysing huge amounts of data. Companies use machine learning to, for instance, analyse journal entries and identify areas that are problematic. (Dickey & al. 2019 EY 2016, 5.)

In the accounting industry, AI can be used for example with tax related regulations in a way that AI is able to inform the accountant of new changes in tax laws and find answers to their questions. Moreover, AI systems are used in transaction processing so that the AI systems identifies discrepancies in transactions and reports them to humans. AI can also help with recommendations and advise in decision making, especially by gathering and analysing huge amounts of information. Currently, AI is mostly used by big and technologically advanced companies. According to PWC (2018, 8), 18% of the surveyed companies already utilized AI in 2017. Approximately 40% use it for invoice processing and around 30% use it for automatic payments (EY 2016, 11 PWC 2018, 8 & 19.)

2.1.3 Blockchain

Blockchain is considered to be one of the most innovative and important new developments of the last few years. It was originally used for trading with Bitcoins. Blockchain is a method that creates a decentralized ledger that offers a safe infrastructure for transactions, especially amongst parties that do not know each other. It also allows information to be accessed by several users in real time with each user having an identical copy of the ledger. Changes are visible to all involved parties as soon as they are validated. This leads to an improvement of security and transparency. Moreover, the identities of payers and payees are identified and blockchain is a tamper resistant method. It helps to avoid manipulation of transactions by giving the authority to verify transactions only to certain people and withholding the transaction verification information from those people who do not have the authority to verify them. Accountants' work, such as auditing and reconciliation is becoming more accurate and faster with less errors and information that needs to be entered manually. However, the use of blockchain depends on the availability of storage systems and computer power of companies. Small and medium sized companies might not have the required financial resources to implement it. (Dai & Vasarhelyi 2017, 5-17; EY 2016, 11; Forbes 2018.)

Blockchain is presently mostly in an exploratory stage meaning that companies research the use and the values it could create. Approximately 8% of the companies used blockchain in 2017. Nevertheless, EY (2016, 13) expect the use of blockchain to grow significantly in the finance field in the future. Some companies use blockchain to exchange secure information between companies. The information is then verified by AI and both companies are able to see it almost in real time. Companies, such as PwC and Deloitte expect blockchain to have a huge impact on business practices and collaborations between companies, customers and suppliers. (Dai & Vasarhelyi 2017, 5; EY 2016, 11-13; Forbes 2018; PWC 2018, 8.)

2.1.4 Robotic Process Automaton

The use of Robotic Process Automaton (RPA) is increasing. RPA means that processes are automated by using robots. Tasks that are likely to be done using RPA are repetitive, based on rules, error prone as well as digital data. Some of the skills that RPA can provide are, for example, gathering and validating information, analysing of data, calculating values, assisting users or costumers, reporting and monitoring of operational performance as well as forecasting of outcomes. (Deloitte Middle East 2018; EY 2016, 9.)

RPA is able to process transactions the way humans do it. Nonetheless, a human is still needed to validate a purchase order processed by RPA for accuracy. However, the manual is work is much less compared to a manually processed purchase order where a person has to check for new orders, confirm and validate them, apply discounts if any are included in the customer's contract and ship and invoice the purchase order. RPA creates benefits regarding accuracy, speed and flexibility. (Deloitte Middle East 2018.) Using RPA eliminates the possibility of human error. Therefore, the amount of exceptions that would need to be checked by humans is decreasing. It also leads to a decrease of costs since many processes are then automated. This also leads to more accounts that can be automatically reconciled, automatically done intercompany transactions and journal entries. (EY 2016, 9; Parcells 2016, 45.)

PWC (2018, 8) state that in 2017 13 % of the companies in their research use RPA already and another 22% are planning to implement it in the future. However, 65 % of the surveyed companies do not consider implementing robotics. Contrarily, research by Deloitte Middle East (2018), shows that most companies are implementing or planning to implement RPA into their operations. 85% of those companies that are using RPA already mention in the research that their expectations regarding accuracy, speed and flexibility have been exceeded. Another 65% state that their expectations concerning cost reduction has been met or exceeded since implementing RPA. EY (2016, 9) estimates that currently companies are creating an understanding of RPA and the implementation of RPA is expected to grow in the future. (Deloitte Middle East 2018; PWC 2018, 8 & 20.)

2.1.5 ERP

ERP systems have been used since the 1990s and currently also allow process automation and provide accurate data. Through the use of ERP systems, the transparency and visibility of information is improved. However, other than blockchain, ERP systems are centralized and easier to be tampered with. ERP systems require human labour in order to operate, whereas blockchain is able to operate mostly automatically. (Dai & Vasarhelyi 2017, 9.)
Nowadays, cloud computing and the possibility for mobile use are incorporated into ERP systems which increases the functionality (EY 2016, 7).

2.2 Accounting workflow

Accounting workflow is a chain of planned and repeatable tasks that are done. It exists in every company and job. Its focus is on the bigger picture of the job. The workflow changes when new technologies and tools are implemented. (O'Bannon 2013, 31.)

A workflow is included in every part of an accounting firm. With an increasing number of automatized tasks, it is important to assess how workflow processes function and if there is a need for improvement order to increase the benefits of automation. This can be task or need specific but also regardless of who does what in the company. Sectors that are relevant for the workflow are billing, document management, payroll, tax document automation and client accounting. (O'Bannon 2013.)

Accounting automation also leads to workflow automation (Brands & Smith 2016, 70). With more automation in the work it becomes more important for accountants to acquire knowledge of data extraction tools since their work then includes the use of data analysis tools which manage and analyse data. According to Thomson (2018, 10) and Brands & Smith (2016, 70), accountants need skills in strategic management for tasks, such as competitive analysis, forecasting and budgeting. Moreover, accountants should evaluate the effectiveness and efficiency of accounting processes and be able to ensure data security while meeting legal requirements. Accountants are expected to become more involved in strategic planning. However, skills such as collaborating with others, communication and motivating others are still going to be required. (Thomson 2018, 10.)

When the workflow of accountants' work is more automated, accountants are able to focus on analysing data, discover business trends and benchmarking (Parcells 2016, 44).

2.3 Accounting competencies

Accounting competencies are the required skills and knowledge that are needed to perform a certain task or job (Merriam Webster 2019b). In the accounting field the competencies are related to reporting the results of the work, data analysis and interpretation, risk management, research of frameworks and standards, as well as the ability to use technology and tools. (AICPA 2019).

Since more and more tasks will be automated in the future, it changes the required competencies and skills of accountants. Accountants need to develop their skills in order to adapt to the change that automation creates. According to EY (2016, 15), accountants' work will shift from generating reports to analysing collected data, handling exceptions and decision making. Ideally, automation is used alongside humans and thus complements their work. Research by EY (2016, 17) finds the most important capabilities of the future to be risk and cyber risk management, planning and forecasting as well as advanced analytics. Therefore, the competencies of accountants would be related to data science and statistics as well as general ability to use different technologies, such as SaaS, blockchain and AI. Nevertheless, strategic and interpersonal skills are still required

since they cannot be replaced by technology and automation. According to Richins, Sta-pleton & Stratopoulus & Wong (2017, 75), accountants need knowledge in areas such as business strategy and the company's business model. Moreover, also basic knowledge of programming languages is considered to be important to better cope with new technolo-gies. (EY 2016, 15-23; Richins & al. 2017, 67-75.)

3 Research methods

This chapter focuses on the research methods. It provides information about the research design and method. Furthermore, the data collection and data analysis are discussed in this chapter.

3.1 Research approach

The chosen research method for this thesis is qualitative research in form of semi structured interviews. Qualitative research is used to research behaviour, opinions, attitudes, experiences, values and perceptions. Contrary to quantitative research, qualitative research's main focus is not numbers but words and is therefore a suitable research approach for this thesis. Qualitative research also aims to focus on smaller samples more in depth. (Blaxter, Hughes & Tight 2010, 65; Elo & Kyngäs 2008, 109; Kothari 2004, 5).

Semi structured interviews are the most common form of research interviews, as they allow the participant to freely answer and they also allow the interviewer more flexibility as additional questions can be asked if necessary or the order of questions can be changed depending on what the interviewee answers (Saunders, Lewis & Thornhill 2016, 391).
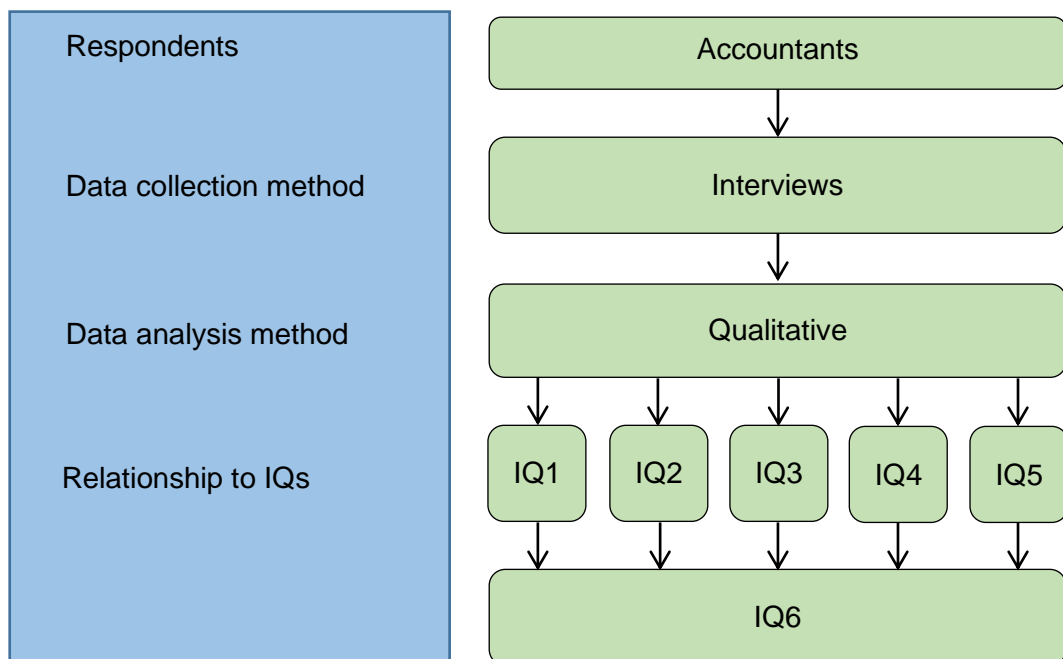
Figure 2. Research methods

As shown above in Figure 2 the respondents of the survey are accountants. The interview questions were formed to collect data needed to answer the research and investigative questions. The interview questions can be found in attachment 1. The collected interview

data is then analysed using a qualitative approach. The interview data provides information to answer IQ1 to IQ5. The recommendations (IQ6) are based on the results gained from the previous IQs' answers (see Figure 3).

IQ 1: What are the recent changes?

IQ 2: What are the anticipated upcoming changes?

IQ 3: How do those changes affect accountants' tasks?

IQ 4: How do those changes affect accountants' competencies?

IQ 5: How do those changes affect accountants' workload?

IQ 6: What recommendations can be made?

Figure 3. Investigative Questions

3.2 Data collection

The interviewees for this research were chosen based on their willingness and availability. Several accounting firms in Finland were contacted but the number of interviewees available to participate in the interviews amounted to only three. Nonetheless, the participants are working in different, medium sized accounting firms that use automation to some extend which adds some diversity to this research.

The interviews were conducted between June and August 2020. They lasted between 20-30 minutes each and were conducted via Skype. Afterwards they were transcribed. The questions were provided to the interviewees beforehand so that they could familiarize themselves with them. However, some additional questions were asked during the interview if the author felt that it was relevant for the research.

4 Data analysis and results

In this chapter the results of the research are presented. The chapter is divided into sub-chapters according to the investigative questions. The participants are numbered P1, P2 and P3, whenever necessary for the presentation of the results.

The first question was regarding the interviewees experience in the field of accounting. Two of the interviewees stated that they have been working for 5 years or less as an accountant, with 2.5 years (P1) and 4.5 (P3) years respectively. The third interviewee (P2) has 9 years of work experience in accounting.

4.1 What are the recent changes?

The first IQ aims to discover the recent changes that happened due to automation. This includes questions about the current use of automation and the challenges the interviewees noticed in their work.

The first question asks about the already automated tasks in accountants' work. All of the interviewees mentioned that Accounts Payable/ purchase invoices and Accounts Receivable/ sales invoices are to some extend automated in their work. Two of the respondents mentioned bank statements as well, see Table 3 below.

Table 3. What tasks are automated.

	What tasks are automated?
P1	AP, AR
P2	Purchase invoices, sales invoices, bank statements
P3	AP, sales invoices, bank statements

The findings are similar to what the theory says, meaning that manual number entering such as AP and AR are most likely to be automated. It is interesting that despite the interviewees working at different companies they have almost the same automated processes.

The next questions focus on whether the interviewees are familiar or recognized some of the key concepts of automation and which of these concepts are used in their work. Table 4 below visualizes the answers. Only one of them has heard all of the concepts before. The other two are somewhat familiar with all of them as well except for blockchain.

Table 4. Familiarity and usage of some concept of automation.

Concept	Familiar with the concept			Used at work		
	P1	P2	P3	P1	P2	P3
Artificial Intelligence (AI)	Yes	Yes	Yes	Yes/ maybe	Yes	Yes
Cloud accounting	Yes	Yes	Yes	Yes	Yes	Yes
Software as a service (SaaS)	Yes	Yes	Yes	Yes	Yes	Yes
Blockchain	Yes	No	No	No	No	No
Robotic Process Automation (RPA)	Yes	Yes	Yes	Yes	Yes	Yes

Artificial intelligence is used in at least two of the respondents' work. P1 was not entirely sure if AI is used in P1's daily work tasks. Nonetheless, all of the interviewees use cloud accounting and SaaS, whereas sometimes it is the case that the used program belongs to both of the concepts. RPA is also used in all of their companies. However, P2 stated that RPA is newly implemented in the company and thus not used much yet. P1 and P3 on the contrary stated that they have tasks that are supported by RPA on a daily basis. Blockchain is not used by any of the respondents.

The results indicate that the most commonly used concepts of automation are cloud accounting, SaaS and RPA. This aligns with the results of the previous question that processes such as AP and AR are automated which is mostly done using AI and RPA. Moreover, cloud accounting and SaaS are used for general accounting processes. The theory states that blockchain is currently in an exploratory stage which would explain that it is not used in any of the respondents' work.

The following question aims to discover the challenges that automation has brought to the interviewees. According to the answers, all of the respondents only encounter small challenges. The most mentioned challenge that they face is when an automated process does not function properly and manual work is required which makes it difficult to allocate time to those tasks since the day or week is scheduled without considering any errors in automated tasks. Moreover, when a process is newly automated it takes time to learn how to handle these new automated tasks. Furthermore, P2 mentioned that people who are against automation and believe a computer cannot be trusted are considered as a challenge as well.

In regards to IQ1, the recent changes in accountants' work due to automation are mostly related to AP and AR processes which both are considered to include many manual tasks and, consequently, are automated using AI or RPA. Moreover, cloud-based accounting systems and SaaS are commonly used in the daily work. Nonetheless, automation also brought some challenges which are mostly related to errors or functionality issues in the automated processes.

4.2 What are the anticipated upcoming changes?

The second IQ focuses on the expected future changes in the accountants' work and role due to automation. In regards to the upcoming changes, all of the interviewees answered that they expect to have less manual and repetitive tasks and, therefore, more time to allocate to other tasks such as customer service, analysing, investigating and reading the numbers. P2 and P3 also expected that the customer contact and communication will increase more in the future as it has already grown significantly during the past years. According to P2, reporting is anticipated to be done even faster since it nowadays already takes less time to do it.

The next questions aim to discover the changes in the role of accountants. As shown in Table 5 below, all of the respondents stated that they believe the role will change in the future. P1 stated that accountants' role will move towards working on different tasks than nowadays. According to P2 and P3, the role of accountants is estimated to shift towards advising and also analysing.

Table 5. Anticipated changes in the accountant's role

	Anticipated changes in the accountant's role
P1	Change towards different tasks
P2	Shift towards financial advisors
P3	Change towards analysing and advising role

However, all of the respondents also expect a decrease in the numbers of accountants, especially related to basic accounting tasks which include manual bookings. Nonetheless, the need for accountants will still exists as some tasks cannot currently be automated and people who understand the books and financial reports will be required in the future as well.

The results show that the anticipated changes include less manual work due to more automated processes. This leads to a change in the role of accountants as they then have

more time to focus on other things such as analysing and advising which were both considered to increase significantly in the future. Nonetheless, the need for accountants will not disappear.

4.3 How do those changes affect accountants' tasks?

This IQ researches the effect automation has on accountants' tasks as well as the influence on efficiency and productivity. First, the changes of the tasks due to automation were investigated.

All of the respondents pointed out that their tasks have changed due to automated processes. Two interviewees said that especially Accounts Payable tasks are now done faster and include less manual work which allows them to focus on other or more tasks. Moreover, it was mentioned that it is not necessary to go through every invoice separately but to only run through the numbers. Nonetheless, the interviewed accountants rely heavily on the system and that it works smoothly.

The following question focuses whether efficiency has changed. The answers show that all of the interviewees noticed a rise in their efficiency. The reasons for this were mostly that some work can now be done faster and they only having to take closer looks at discrepancies that are noticed by the system. Furthermore, the respondents have more time to allocate to other matters such as customer meetings as well as presenting and explaining the numbers to them.

The respondents also experienced an increase of their productivity. P1 stated that more tasks can now be handled in the same time compared to before. P2 and P3 also stated that tasks are done faster and providing information to the customer can be done at a faster rate. Moreover, P2 stressed that reporting can be done quicker as well.

As already discussed in IQ2 the role of accountants is expected to change. Consequently, the accountants' tasks are affected as well. The results of IQ3 indicate that manual and repetitive tasks are now done at a faster rate which, as expected, also leads to an increase of accountants' efficiency.

4.4 How do those changes affect accountants' competencies?

IQ 4 examines accountants' competencies which includes the recent changes as well as the expected changes in the future. Additionally, changes of importance of several competencies are researched.

The respondents stated that accountants' technical knowhow has increased. However, P1 did not notice any changes in capabilities which was explained due to P1's shorter work experience in accounting. The other interviewees noted that accountants should have a basic understanding of how automated processes work and be willing to learn new programs and adapt. P2 stressed the importance of knowing how to use different tools ranging from Excel to cloud-based accounting software.

All of the interviewed accountants expected more changes of competencies in the future. The anticipate changes are mostly linked to an increase of technological knowledge and ability to use different software and tools. Furthermore, openness towards automation and the thereof resulting new processes and tools are expected to grow.

The next interview question takes a closer look how certain competencies have changed during the accountants' career. The competencies are decision making, analysing, interpersonal skills and programming. Table 6 below provides an overview of the results.

Table 6. Changes of competencies.

	Decision making	Analysing	Interpersonal skills	Programming
P1	No change; there are not many major decisions to make	Become more important	No change; but one needs to know how to communicate with the customer and colleagues	No change and it is also not required since there is a support team
P2	Currently done a lot; the final decision is not made by the accountant	Increased; more in-depth analysis required and providing options and solutions	Increased; communication with clients increased	Not done by accountants
P3	Small change; final decisions are not made by accountants	Increased; customers also require more in depth and faster analysis	Small increase; customer contact increased and it has become important to communicate with them	Not the accountant's work but the IT team's

The answers indicate that competencies related to decision making changed a little or not at all. P1 stated that major decisions are not made by P1. P2 and P3 noticed small changes and decision making is considered to be important but final decisions are usually

not made by the accountants themselves. An example is that clients might ask if a specific process could be automated and accountants can present what is suitable for the client but the final decision is not the accountant's.

All of the interviewees experienced an increase of analysing skills. Moreover, the customers also require more analysis to be done. Real time accounting allows for faster and better analysis. Furthermore, the need for in depth analysis has grown and accountants should also provide options and solutions to their clients as stated by P2.

The interviewees opinion regarding changes of competencies regarding interpersonal skills varied. P1 did not see any change but stressed the importance of good communication skills, especially when communicating with the customer as well as with other colleagues. According to P2, interpersonal skills have increased as there is more costumer contact. Therefore, the importance of communication and listening skills has grown as well as it is important to understand what the client wants and to be more customer friendly. Additionally, P3 noticed a small change in interpersonal skills which was explained with increasing customer contact and the thereof resulting ability to communicate with them properly.

Programming is not considered to be a required skill for accountants at the moment or in the future according to the respondents. The companies for which the interviewees work, all have their own IT or support team that takes care of programming related issues, so there is no need for accountants to know how to program. However, P2 specified the importance of good communication with the IT team in order to for the accountant to explain what the IT team should look into or what would be needed or good to have related to automating further processes.

In terms of competencies required by accountants, the results of IQ4 indicate that they have changed, especially in technological areas. It has become increasingly important for accountants to be able to use certain software and tools as well as having a basic understanding of some automated processes in order to keep up with the growing amount of automation in their line of work. Apart from technological knowledge, the results show that analysing skills have become more important as well since also the clients expect the accountants to do more in depth analysis. Furthermore, the importance of interpersonal skills, especially communication skills, has grown. This is also due to more customer contact than previously. The research discovered that major decision making is not done by the accountants. Despite the theory mentioning an increasing importance of at least a basic level of programming skills, the research discovered that these skills are not needed

by the accountants themselves since the medium sized accounting firms they work for have their own IT department.

4.5 How do those changes affect accountants' workload?

This IQ aims to discover how automation has affected the accountants' workload. The focus lies on the recent changes as well as the anticipated future changes.

The respondents answered the question mostly with yes and no or somehow as shown below in Table 7. The interviewees noticed that their work is done faster because of automation and if the workload decreases due to this, they take on additional work or get assigned new tasks. However, it was mentioned by P1 that the total workload is a suitable amount for the working day.

Table 7. Changes of the workload.

	Has the workload changed due to automation?
P1	Yes and no; tasks are done faster so more tasks can be done; suitable amount of work for one working day
P2	Yes and no; if workload decreases new tasks will be assigned
P3	Somehow; less time to do tasks so other tasks can be done additionally

The accountants expect the workload to continue to change the same way it has changed so far. This means that when more processes will be automated, the work is done at a faster rate and there will be more time for the accountants to do additional tasks. Furthermore, it was stated that an increase of automation requires accountants to be more efficient and their willingness and openness to move to automated processes.

The results of IQ5 show that it is difficult to determine the changes in accountants' workload. This is due to automated tasks taking less time to do and thus decreasing the workload but at the same time additional work is assigned which in return leads to an increase of the workload.

4.6 What recommendations can be made?

The recommendations that can be made, based on the results of the previous IQs, are that it is crucial for accountants to have an open attitude towards automation and changes. Moreover, the importance of technological knowledge increases. Therefore, accountants should possess knowledge of how to use software and tools as well as a basic

understanding of how automation and automated processes work. The willingness to learn these new tasks is also considered to become more important. Nonetheless, good communication skills and analysing abilities are also recommended proficiencies for accountants.

5   Conclusions

In this chapter, the results of the research are discussed with the main focus on the research question. Moreover, this chapter includes recommendations for future research. The reliability and validity of the research are also commented on.

5.1   Discussion of the results

The aim of this thesis is to investigate the impact of automation on the work of accounting professionals. The research results indicate that automation has so far had an impact on the work of accountants and is also expected to have a growing impact in the future.

The results show that the current impact of automation is mostly related to manual tasks which are accounts payable and accounts receivable related and are automated using artificial intelligence and robotic process automation. Furthermore, cloud-based accounting and software as a service are used as well. This aligns with what is described in the theory part that repetitive tasks are most likely to be automated first. The results indicate that the accountants are somewhat familiar with the different concepts of automation. As the theory states that blockchain is currently a new approach in automation, this also reflected in the research results since this was the concept that the respondents were least familiar with and it is at present not used in any of their work. Nonetheless, the results show that automation also brought some challenges to the work of accounting professionals. These challenges are mostly related to technical issues of automation and people who are against automating processes.

According to the results, the impact of automation is noticeable in the accountants' work, role and competencies. The main impact on the work of accounting professionals is the time savings. The research showed that tasks are done faster with the use of automated processes which allows the accountants to do additional tasks as well. The additional tasks are mostly related to advising, analysing or doing more tasks. Customer contact and communication were also found to grow. Moreover, the results show that the efficiency and productivity increase with more automated processes. The results show that this change is expected to continue in the future which then has an impact on the accountant's role. Consequently, the accountants' role is anticipated to shift towards advising and analysing. However, the accounting profession is not expected to disappear.

The results of the research indicate that automation has an impact on accountants' competencies. Technological skills as well as interpersonal skills have become more significant. This is due increased customer contact which requires good communication skills.

The increase of the importance of technological skills is due to more automated processes which require the accountants to have a basic understanding of how automation works and what it is. Furthermore, the results indicate the grow of analysing abilities as the role of accountants shifts towards this and clients are expected to require more analysing from the accounting professionals.

The research showed that automation has somewhat an impact on the workload but it is difficult to determine. The results indicate that the workload decreases and increases due to automation. The decrease in workload is due to tasks being done at a faster rate whereas the increase in workload is explained by the accountants taking on additional tasks.

5.2   Recommendations for further research

Since this research only included accountants working in medium sized accounting firms, it would be worth researching the impact of automation on smaller accounting firms and whether these differ from those of medium sized or huge firms.

Moreover, due to the small sample size it would be interesting to research a larger sample or compare the automation in accounting of different countries. Another aspect worth re-searching could be to focus on one area of accounting such as accounts payable or accounts receivable and investigate the impact of automation specifically in this area.

5.3   Reliability and validity

In regards to reliability, the origin of the data needs to be distinguishable, whether it is the interviewee's statement or the author's interpretation thereof. Furthermore, the procedures of the interview and data analysis need to be made clear in rechecking and training, so that the comparability of the researched can be increased, if it is conducted by several interviewers. (Flick 2009, 387).

According to Saunders & al. (2016, 400-401), the validity of qualitative research requires carefully prepared interview questions. This means that questions should not be suggestive towards an answer but the interviewees should be allowed to answer according to their own views. Additionally, the questions should be unambiguous and precise in order to collect relevant data. (Saunders & al. 2016, 400-401).

These concerns regarding reliability and validity have been taken into consideration when creating the interview questions as well as during the interviews.

However, the main issue of this research in regards of reliability and validity is the small number of interviewees. Several companies were contacted but refused to participate in the research. Nonetheless, the respondents work for different companies so that it was possible to get relevant answers.

5.4 Reflection on learning

Writing this thesis has helped the author to gain deeper knowledge of automation and its impact on the work of accountants. Since there are not many books available on this topic, the author gained more searching for academic resources and articles. Besides, the author increased her knowledge of conducting qualitative research and interviews.

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Attachments

Attachment 1. Interview questions

1. How long have you been working in the accounting industry?
2. Has automation brought any challenges to you?
   - If yes, could you describe the changes? How have they influenced your work?
3. What processes are automated in your work?
4. Are you familiar with/ do you recognize the following concepts?
   - AI, cloud accounting, SaaS, blockchain, RPA,
5. Do you use any of the following in your work?
   - AI, cloud accounting, SaaS, blockchain, RPA
6. How do you think automation will change the accounting profession in the future?
7. Do you think the accountant's role will change in the future?
8. Do you think that there will be fewer accountants in the future due to more automated tasks?
9. Have your tasks changed due to automation?
   - If yes, could you describe the changes? How have they influenced your work?
10. Has automation influenced your efficiency?
    - If yes, how has it changed?
11. Has automation influenced your productivity?
12. In your opinion, have accountants' competencies changed during your career?
13. Do you expect them to change in the future?
14. Has the importance of the following competencies changed during your career?
    - Decision making, analysing, interpersonal skills, programming
15. Has your workload changed because of automation?
    - If yes, how has it changed?
16. Do you think it will change in the future?