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Impact of Automated Accounting Software on Bookkeeping Jobs

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Automation has been discussed as potential threat to many jobs, including those in accounting. The implementation of accounting and ERP software has had an impact on all employees in this field and especially routine tasks such as those in bookkeeping are rarely performed by humans. Automation, however, brings both, threats, and opportunities to the workers in the field.

The goal of the research was to map out the historical and current practices related to the automation of bookkeeping. The research focused on the development of automation in bookkeeping and what the usage of accounting software has meant for bookkeepers employed by large multinational companies.

In the theory part, the history of the automation in bookkeeping is described, from the early involvement of computers to Robotic Process Automation. The components of automated accounting software are introduced, and selected accounting and ERP software are presented. The chapter ends with assessing the overall advantages and disadvantages of the software currently available.

The actual practices in companies are examined in the empirical part by analysing survey sent out to bookkeepers in various companies. The focus of the questions was on advantages and disadvantages for the individuals' jobs and on how they have learned to cope with the software. Comments on the topic from two interviewees were added to the survey responses analysis.

Both the survey analysis and answers from interviewees show that at the moment, automated software is not yet capable of doing the full spectrum of tasks and it brings positives and negatives to the daily jobs of bookkeepers. The common practice has been that bookkeepers learn to use the software on the job and the demands on them are high in the sense that companies often use multiple software for accounting. The job itself is highly likely to undergo a significant shift in the upcoming years by changing the scope of skills and knowledge required.

Keywords
Automation, Accounting Software, Bookkeeping, ERP

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1 Introduction

The aim of this chapter is to introduce the topic of the thesis and the objectives of the research. Firstly, the background for the topic is described from the business perspective. Next, the Research Question is formulated and divided into subchapters- Investigative Questions. Demarcation is then set for the thesis to limit the scope of the topic and make sure the thesis includes an international aspect. Finally, key concepts related to the topic are explained to provide context for the thesis.

1.1 Background

In January 2019, The World Economic Forum organized its Annual Meeting, one of the most significant business conferences in the world. Many of the talks mentioned the so-called Industry 4.0 and the impacts it will have on the world economy. (World Economic Forum 2019.) Business leaders agreed that smart machines will eventually be able to replace all sorts of workers performing routine tasks, naming accountants as one of America's 47% most threatened positions. (Elliott 2019).

The terms such as Artificial Intelligence, Automation, Digitalization, or industry 4.0 have been appearing in the media a lot in recent years and will undoubtedly have a significant impact on the economy and employment. The Institute of Management Accountants (IMA) conducted in 2016 a research among 751 financial professionals across industries and company sizes regarding the automation of accounting tasks and found out that the majority of tasks automated fall into the category of bookkeeping: accounts payable, accounts receivable or journal entry creation. Automation brings both challenges and opportunities for the industry. Users of automated accounting software benefit primarily from time freed-up for more important tasks and higher accuracy of tasks performed, which resulted in overall higher efficiency of business processes. (IMA 2016.)

1.2 Thesis objective

This thesis aims to analyse which accounting automation software is currently available for companies and which tasks they can perform. The issues related to using automated software are the impacts partly on employment as a whole and partly on the daily jobs of affected employees. The latter is in the focus of this research, namely what are the advantages and disadvantages of the software regarding daily bookkeepers' jobs. Part of the research is also to capture what has been the development of automated software and to what extent have the employees themselves noticed this development. Finally, with the

software becoming increasingly more powerful, the question is, whether there are even any tasks that cannot be automated.

The outcome of the thesis is an analysis of how the computerized accounting information systems have changed the job of bookkeepers regarding the quality and quantity of the tasks they nowadays need to perform. The results of the thesis are used in designing recommendations for Haaga-Helia University of Applied Sciences. The recommendations suggest, which topics might be implemented in the accounting studies to prepare students for current requirements of the jobs in this field.

The research question (RQ) can be worded as **'How is automated accounting software used and what are its impacts on jobs in bookkeeping?'**

To answer the RQ, the following Investigative Questions (IQs) are researched:
IQ 1. Which automated accounting software is currently available and how do employees learn to use it?
IQ 2. What are the advantages and disadvantages of those systems from the employees' perspective?
IQ 3. How has the nature of bookkeepers' jobs changed over time due to the usage of accounting software?
IQ 4. Which bookkeeping tasks are currently impossible/inappropriate to be automated and why?
IQ 5. Recommendations to Haaga-Helia University of Applied Sciences: What could be added to the contents of accounting courses to equip students with the necessary skills for the workplace?

1.3 Demarcation

To limit the scope of the thesis, the literature review and research will focus on the following; employees involved in bookkeeping processes; handling Accounts Receivable (A/R) and Accounts Payable (A/P), in other words, the final stages of Order-to-Cash (O2C) and Procure-to-Pay (P2P) processes. The literature framework will cover the past and current practices of automation with an only minor focus on outlining the possible future in the field. Both the literature review and the research aims to map out the impact of automation on employees themselves and their experiences, rather than on experiences of the companies.

The data for the research was collected from employees in professions related to the above-mentioned disciplines, currently employed by large multinational companies in European countries.
As the recommendations are focused on Haaga-Helia- a Finnish education institution, a minor focus is also put on specifics of bookkeeping in Finland, both in terms of the discipline itself as well as some of the most popular software.

1.4 Key concepts

Automation is the process of using a machine or several machines (nowadays mainly computer) to perform various tasks. The purpose of automation is either to make a process previously performed by humans faster or more accurately or to perform such a process that would not be possible without the use of technology. An automated system requires initial programming and is then able to perform given tasks without human intervention (Groover 2019.)

Computerized Accounting Information Systems or accounting automated software is a type of software that stores master data and other financial information relevant for the company. The system processes this data to provide information for internal decision makers or external authorities. The majority of businesses use nowadays some form of such a system. Accounting Information systems are usually incorporated in the company's Enterprise Resource Planning software. (Miller-Nobles, Mattison, & Matsumura 2019, B-2.)

Enterprise Resource Planning (ERP) is integrated software that stores key data of a company in multiple departments (modules) and enables a flow of the data between different modules. ERP systems can be customized to serve different types of companies. Implementing an ERP system provides a company with cost savings, more efficient processes, and a platform for standardization. (Rouse 2019.)

Bookkeeping is a discipline within financial accounting that deals with recording business transactions according to accounting standards and bank reconciliation. Nowadays the shift is from mechanical data entry to providing information for decision-makers. Bookkeepers are thus required to think about the needs of the business, understand the transactions, and come up with the most effective ways to record and present data of the company. (Institute of Certified Bookkeepers.)

2 Theories describing automation in the context of bookkeeping.

This is the theoretical framework chapter. It aims to summarize the theoretical knowledge base needed to conduct the empirical part. This chapter expands on the key concepts mentioned in chapter 1 and focuses on theories in three main areas- the role of bookkeeping in an organization, the evolution of automation software regarding accounting, and a description of the currently available software.

Firstly, theories describing bookkeeping are introduced with the aim to define bookkeeping and make sure the research follows the demarcation set in chapter 1. The purpose is also to justify the selection of this discipline for analysing the impacts of automation. Some specifics of bookkeeping in Finland are also briefly mentioned.
Secondly, automation in business processes is described focusing on the correct definition of the term and mapping out the history of automation, describing the specific applications and programs that pioneered automation and those leading in the industry today. Possible future impact on employment is also briefly described.
Further, the components that are commonly integrated in accounting software are described. Finally, examples of the most widely used automation software in Europe are introduced with a description of what services they offer to their customers with the focus on A/R and A/P processes. Also, the most common accounting software in Finland is described.

The theoretical chapter ends with a summary of the advantages and disadvantages of currently available accounting software from the employees' perspective. This summary served as a basis for the creation of the survey used for the data collection.

2.1 Specification of bookkeeping as an accounting discipline

The usage of the European double-entry bookkeeping in business dates to the 15th century when the primary goal was to keep track of business transactions. The basic idea of this method is still used today. Nowadays, the focus is rather to get an overview of the financial performance of an organization while complying with the legal requirements and create a basis for decision making. (Nothhelfer 2017, 11-16.)

Bookkeeping is a subcategory of accounting. As such, it is usually categorized under financial (external) accounting and thus regulated by national laws in terms of correct prac-

tices. Bookkeeping, however, does not have a single unifying definition and every organization adjusts the scope of the tasks and the name of the position as best suited. Some companies do not use the term bookkeeping at all and organize bookkeeping tasks simply under financial accounting (Miller-Nobles & al 2019, 17-22.)

Bookkeeping is often performed by entry-level employees, but the knowledge of bookkeeping principles is necessary also for higher positioned employees, especially for understanding financial reports. Bookkeepers work either in-house, serving the same company that employs them or they work for specialized accounting firms where they serve the needs of multiple companies (customers). Finally, bookkeepers can also work as freelancers, serving primarily small businesses. (Depersio 2019.)

2.1.1 Scope of bookkeeping tasks

The Institute of Certified Bookkeepers, the world's largest organization focused on bookkeeping, aims to educate about best practices in bookkeeping and provides a generic scope of tasks commonly performed by bookkeepers. The institute mentions tasks such as handling of A/R and A/P, payroll, bank reconciliation, and cash flows. The overall goal is to keep records of transactions and provide information for management. (Institute of Certified Bookkeepers.)

The organization recognizes the recent trends related to the development of automation and AI but argues that rather than taking over bookkeepers' jobs, those advancements will liberate human workers from timely and manual tasks. While bookkeeping as an occupation will exist in the future, the daily tasks will shift towards the communication of financial information, drawing conclusions, and supporting decision making on higher levels of the company. The required skills will then comprise of high computer literacy and communication skills. (Institute of Certified Bookkeepers.)

In the larger scale of businesses, the two main processes that bookkeepers are involved in are the final stages of Order-to-Cash (O2C) and Procure-to-pay (P2P). Order-to-Cash captures the flow of data and necessary transactions between the time a customer makes an order, throughout the physical delivery of a product (or performance of a service). This is followed (according to the contractual terms) by the issuance of invoices and collection of cash on the receivables of the corresponding invoice. (Shannon 2012.)

The Procure-to-Pay then captures the flow of data and transactions from the point a person within the company makes an order for goods or services, receiving of these goods or services and receiving an invoice until the moment cash is paid on the corresponding account payable- this part of P2P process is sometimes called Invoice-to-Pay. (Shannon 2012.)

Large companies have standardized and often automated the data flow and other aspects of the O2C and P2P processes to perform them as efficiently as possible since those happen multiple times a day in different locations of the company. ERP systems enable an instant flow of data e.g. between warehouse and accounting department and are also able to automatically create invoices, track collection of cash and notify of overdue sales/purchases. (Shannon 2012.)

2.1.2 Importance of bookkeeping for organizations

Porter in his widely known concept of Value Chain categorizes bookkeeping, along with other accounting activities under Firm Infrastructure Functions, and sees those as supporting activities. This means that accounting, unlike the primary value chain activities, is not an activity that creates value for a company. Often, accounting is categorized as an overhead expense (depending on the core activities of a company). Porter debates, however, that if accounting is well integrated and provides high-quality reports for decision-makers, it can significantly contribute to creating a competitive advantage. (Porter 2004, 43-45.)

Porter's view is that a company should focus most of its resources on developing the competitiveness of the primary (value creating) activities. Supporting activities are thus seen as suitable for outsourcing or offshoring to reduce costs and shift primary focus from those activities (Porter 2004, 40.) Porter, however, does not mention automation directly in relation to accounting and only lists automation as an option when talking about manufacturing processes.

It is important to note that Porter's models including the Value Chain have been debated lately questioning their relevance in today's economy. Generally, the value creation chain holds true especially for mass-manufacturing companies and merchandisers, which may however be of low relevancy for service companies. (Merchant 2012).

Single disciplines within accounting can be divided further based on their strategic importance for the organizations. This can be done by splitting the accounting disciplines and the tasks into two categories: Traditional Support Functions and Strategic Functions. (Oluwatobi 2017.) The division of the disciplines can be seen from Table 1 below:

Table 1. Split of financial functions in a company

Traditional Support Functions	**Strategic Functions**
Bookkeeping and A/R + A/P	Strategic and financial planning and analysis
Financial Reporting and Control	Treasury and working capital management
Tax and compliance	Capital Budgeting.

The idea of this model is that the traditional support functions provide data and reports to support strategic functions and the outcomes of strategic functions are directly linked to a company's strategy. Those strategic functions must work closely with the top management. It makes sense then for a company to focus its resources on strategic functions and outsource the support functions. (Oluwatobi 2017.)

Shannon (2012) argues that A/R and A/P processes are often overlooked by financial executives as a merely back-office matter. However, if not enough attention is paid to their optimization, they can cause a lot of additional costs to the company, delay cash flow, and result in inefficient use of time by the accountants. The way those processes are done should be evaluated constantly together with the employees to make sure the systems and software serve their purpose. (Shannon 2012.)

2.1.3 Outsourcing

As described above, accounting, in general, is often viewed as a supporting function in a company and that makes it a common subject to outsourcing and offshoring. Krell (2007) found that the market of accounting sourcing services has been rising steadily since 2000, making it a multi-billion market in the US itself. Outsourcing of at least some part of financial service has become the standard for multinational corporations around the world. (Krell 2007, 41-42.)

A research was done by Oshri and Kotlarsky (2009) among CIOs and CFOs of 263 major European companies shows that the benefits of outsourcing are mainly:

- access to skills that would not have been available internally in the company

- cost reduction caused by the fact that specialized outsourcing centres can perform the tasks faster and with fewer errors
- access to innovations without the need to keep up with those internally
- freeing up internal resources for core activities of the company

However, there has also been some criticism of outsourcing, especially in financial services. The main points of criticism being the unclear value of money, lack of governance, and loss of control. (Oshri and Kotlarky 2011, 62-65.)

A popular practice that combines the advantages of outsourcing while minimizing its negatives has been establishing a shared services centre. Many large multinational companies have utilized this solution in recent years. Shared services mean centralizing accounting and other administrative support functions in one place and then either keeping it in-house in close proximity to other functions or relocating (possibly even offshoring) to more cost-advantageous areas. In any case, the employees of Shared Service centres remain directly employed by the company and so it is not a case of pure outsourcing. (Oshri & Kotlarky 2011, 71-75.)

2.1.4 Specifics of bookkeeping in Finland

Outsourcing of bookkeeping in Finland is common and even recommended by the local authorities. The main reason outsourcing is advisable as a viable option is an improved quality and compliance with the regulations. In Finland, there are accounting firms of all sizes, however, the expertise cannot be judged purely based on the size. The accounting exam that guarantees a legally accepted qualification is called Kirjanpidon ja Laskennan Tutkinto (KLT) (Suomi.fi 2019.)

Technology plays an important role in the job of a bookkeeper in Finland. Using accounting software has become the industry standard and literacy in some ERP or accounting software is a common requirement for employees in this field. Finnish companies use both, international ERP as well as software developed in Finland that is often able to serve better in terms of language and local accounting standards. (Laas 2019.)

2.2 Computerization of bookkeeping

The degree in which computers were involved in work previously performed by humans can be described as a process of digitization -> automation -> artificial intelligence. Those

terms are often used interchangeably, especially when describing the 4.0 Industry, however, they bear different meanings. (Bloomberg 2018.)

There is a clear definition of digitization available, according to Gartner's IT Glossary, digitization means *'taking an analog process and changing it in a digital form without any changes to the process itself'*. (Gartner Information Technology Glossary). In the context of business processes, this usually means taking a process previously done using pen and paper and transform it into a computerized process. Digitized processes can still involve a lot of manual input because those processes do not run based on algorithms i.e. the computerized system does not make any own conclusions. Digitization is nowadays a standard practise in most business processes. The term digitization is often confused with digitalisation which is a vaguer term as it describes a digital transformation of a business as a whole. (Bloomberg 2018.)

Automation then goes a step further from digitization as it means to not only transform processes to make them digital but also automating processes previously performed manually, using a set algorithm. The automated processes replace human workers to some extent but are still limited in highly complex or creative areas. Automated processes, however, free human workers from repetitive tasks, so that they can focus on solving more complex issues. (Brynjolfsson & McAfee 2017.)

The highest degree of computer involvement is then artificial Intelligence and machine learning. These go even beyond automation- an algorithm using machine learning is not only able to replicate all processes performed by humans but can also perform them faster, with higher precision, and is able to improve itself based on data collected from previous processes without human intervention. (Brynjolfsson & McAfee 2017.)

2.2.1 Early computerization

Bookkeeping was an analog process for centuries and even today in some countries and companies remains a matter of pen and paper. The first documented use of computers for bookkeeping purposes was in 1955 when General Electric used a computerized machine developed together with IBM for their client, Bank of America. The machine was able to process checks and record the necessary accounting transactions, this was purely a matter of digitization and no software was involved. This machine was remodelled later using a simple programming language and was sold under the name ERMA (Electronic Recording Machine Accounting). The machine was tweaked continuously and only three months

after the launch it was able to process 55,000 transactions a day and significantly reduced the manual work of bankers. (Swedin & Ferro 2007, 55-56.)

2.2.2 Spreadsheet programs

The second big leap in accounting automation was in 1979 with the development of VisiCalc (an abbreviation of Visible Calculation). This was essentially the first form of a spreadsheet program that could perform the most basic functions of today's Microsoft Excel (calculation and dynamic changes of numbers in cells). Lotus 1-2-3 was then a program very similar to the VisiCalc but developed by a competing company. Those programs were highly popular within businesses and remained in use until Microsoft introduced its Microsoft Excel in 1985. (Swedin & Ferro 2007, 92-93.) Both, VisiCalc and Lotus 1-2-3, enabled digitization and to a limited extent, even automation (mainly of calculations). Data had to still be put in manually i.e. no export/ import of data was possible. Also, the amount of data that could be stored and processed was limited. (Grad 2007.)

Spreadsheet programs can be considered as automation software since Excel formulas provide automated calculations or data search. Macros represent an even higher degree of automation and customization at the same time. The usability of the Excel functions and macros largely depends on a specific user of the program- how familiar and capable they are with the MS Excel. Spreadsheet programs, notably the Microsoft Excel remain widely used by businesses of all sizes and industries, research suggests that 90% of companies nowadays use Microsoft Excel for at least some accounting tasks, those being primarily financial forecasting and budgeting. (Brown 2018.) Microsoft Excel can also be utilized for bookkeeping. However, this is the case for small companies, where the scope of operations does not require more sophisticated software. (Gregory 2019.)

The usage of modern MS Excel alternatives, such as Google Sheets has been on the rise, especially in small businesses. Even though the scope of functions is notably smaller, Google Sheets is popular due to small or no cost of implementing and simplicity of use. (Brown 2018.)

2.2.3 Need for automation

Automation is not a new practice in business processes. In the 20th century, however, the main focus was on automation in manufacturing processes and thus reducing costs of direct labor and making the manufacturing process more efficient with fewer defective

prodicts. Business process automation came later due to higher requirements for computer performance and higher complexity that automation of those processes represents. (Porter 2004, 105). The rapid emergence of automation was party caused by more powerful computers available and partly by the aim to reduce costs and increase the efficiency of business processes. In the case of accounting, the best way to achieve this was proven to be the automation of the processes. (Nagarajah 2016.)

In terms of accounting, until the early 1990's all that software was able to automate was double-entry bookkeeping, calculations, and creation of income statement and balance sheet. The software was not yet capable of many tax-related issues or automated invoicing of clients. (Ryan 2012.)

The increase in regulatory intervention for the correct practices in accounting also contributed to higher automation. Employees were no longer able to keep up with all the regulations, namely with International Financial Accounting Standards (IFRS). These standards prescribe the correct practices of bookkeeping and must be followed by multinational corporations in countries that endorsed the standards into its national accounting standards. (IFRS 2019.) The IFRS have been criticized for their complexity, unclear interpretations in some cases and conflicts with GAAP. Despite those criticism they remain as the primary accounting standards in the EU. (Nobes 2013). Bookkeepers are expected to keep up with the changes in the standards, but since individuals are no longer able to do so, companies are forced to use consultancy companies' services or rely on accounting software that is capable of providing updated compliance with the required standards. (Aburous 2019.)

2.2.4 Business process automation

When talking about the automation of business processes, two key terms are used to describe the degree of automation: Robotic Process Automation and Business Process Management. (Deshpande 2019).

Robotic Process Automation (RPA) is an older and simpler form of automation and is based on replicating single tasks that would otherwise need to be performed manually by human workers. RPA Tasks need to be initially created (programmed) by a human and can be customized to fit the person using them. Example of RPA used in accounting is above-mentioned macros in MS Excel. Macros need human input to function. It is up to this human to decide on which tasks and how the macros will work- the end result is only

as good as the instructions given to the software. The main reason for implementing RPA is to reduce time spent on data input, data transfer, or calculations- tasks that do not add value but are necessary for other functions to perform well and can take a significant amount of time. (Deshpande 2019.)

Business Process Management (BPM) describes the automation of a whole end-to-end process. BPM consists of multiple RPA tasks and is able to sequence them in the most efficient way to support the business. The need for efficient and thus automated BPM led to the creation of ERP software, that in itself integrates multiple RPA tasks and comes as close as possible to the idea of full business process automation. (Deshpande 2019.)

2.2.5 Emergence of ERP systems

With the increased amount of data flow in businesses and business units being in different geographic locations, a single solution supporting only financial functions was not sufficient anymore. The need for a more complex system emerged, that would incorporate all business units where the units could communicate with each other. This was in the early 1990s and led to the creation of ERP software. (Patel 2017.) The term ERP has been used since 1960s, but the term was first formally recorded by Gartner IT Glossary in 1990. Even though initially intended for large corporations, ERP software has been also successfully leveraged is small and middle-sized companies around the world. (ORACLE NetSuit.)

ERP connects two important trends in today's business processes. Those two are Enterprise Application Integration (EAI) and Business Process Automation (BPA). EAI ensures the availability and flow of required data between different business units by integrating the application used by different units into one larger solution so that the flow between different applications copies the set business processes. An example of this is the flow of data between purchasing, to the warehouse to accounting. BPA then means that this flow is automated with data appearing in real-time across the units and all required documents being generated automatically during the flow and delivered to the right people without human intervention needed. More specifically this means for examople an automated issuance of an invoice upon marking from the warehouse that goods have been shipped. (Scheer & al. 2004, 9-11.)

Implementation of ERP systems comes with a significant cost for the company, both in terms of obtaining and integrating the system large companies and in training or retraining

the employees. A commonly used practice to partially offset the costs is a so-called Tier system. (Rouse.) This system works as follows:

1. one of the main ERP players (e.g. SAP, Oracle) is used on the corporate level as Tier 1 ERP for consolidation, reporting, and forecasting.
2. Tier 2 ERP is then used on lower company levels and in different divisions. Tier 2 ERP can either be a simpler version of the big players (e.g. Oracle NetSuite), a solution supplied by a local company, or even internally developed solution.
3. Based on the size of the company and its needs, there can also be a Tier 3 ERP usually made up of similar solutions as Tier 2.

The Tier system can also occur as a by-product in a situation when a company grows through acquisitions and ends up with a set of different ERP systems. (Rouse.)

2.2.6 Cooperation of humans and software in accounting

Accounting software runs on a predefined algorithm and is thus programmed to merely repeat a set of steps based on various criteria. The scope of tasks that can be performed repeatedly based on an algorithm in regard to accounting includes mainly calculations based on predefined pricing, tax rates or discounts given, transaction processing, and data flow between various units. More advanced software, which algorithm is based on enough data can also be able to learn and forecast future outcomes of different financial decisions. (Mutlak 2018.)

Human involvement in such a setting is needed primarily to manage various situations arising or correcting errors. Companies in the current business environment employ automation on different levels and also use various software, different invoicing channels, and invoice templates. Accounting therefore cannot be automated perfectly. Similarly, the software can only use the information that was given to it. In a situation such as special contractual terms for customers, the software is not able to apply those, and human involvement is necessary. (Rose 2018.)

In conclusion, in the bookkeeping processes, humans are needed for managing exceptions, for example in the A/R process, somebody only needs to validate a Purchase Order with a single click based on customer's contract terms. Less time of human workers is required on routine tasks such as handling purchase orders and invoicing. This gives the opportunity to process a much larger amount of transactions with much fewer employees. (Mutlak 2018.)

2.2.7 Impact on employment

In its research conducted in 2016 among the Big 4 Firms, Financial Times concluded that there has been a decrease in hiring of recent graduates since the administrative work previously performed by entry-level employees has been largely automated. This was the case for applicants with qualifications in accounting. Those with strong analytical skills and computer literacy on the other have been in high demand. The Big 4 representatives have reported that they expect entry-level hiring to drop by as much as 50% by 2020. (Agnew 2016.)

Autor (2015) in his paper 'Why Are There Still So Many Jobs' concludes that while automation of tasks has been occurring and will be occurring at a larger scale, this cannot be directly compared to the automation (and thus disappearance) of jobs. He is certain that necessary skills for middle-level workers (among others in accounting) will change; naming, for example, analytical skills, providing support for decision-makers, and largely interpersonal skills to dominate in those positions. He also adds that the necessary education and job training are likely to change due to automation. (Autor 2015, 27-28.)

A research paper called 'The Future of Innovation and Employment' by Oxford University together with Citi Financial Services came to a similar conclusion as Autor (2015). In fact, the paper states that we can already see to some extent that a lot of entry-level jobs in financial services will take on the role of consultants and their role will be much more about being able to interpret data generated by automated software and provide advice. This trend is likely to continue in the future. (Frey & Osborne 2015.)

Tech companies tend to be much more drastic in their predictions about the impacts especially of AI on jobs. For example, the tech giant Google has committed to donate 1 billion USD to non-profits that aim to equip workers laid-off due to automation with new skills to ensure their further employability. (Wakabayashi 2017.)

The debate in public has been whether the current education of bookkeeping really prepares students well for the job. In an article written by John. A. Majernik as early as in 1968, the author argues that there is a little value in teaching students the manual principles of bookkeeping when that bookkeeping is done very differently in real life. This leads to frustration and little enthusiasm on both sides- teachers and students. (Majernik 1968.)

2.2.8 Possible future and artificial Intelligence

Despite artificial intelligence is often used as a term of the future, there are decades-old articles published in accounting and business magazines debating this topic. An article with the title ‘Artificial Intelligence- the future has arrived’ was published already in 1987 by Anthony Barbera. In 1991 Daniel O’Leary published an article that explores what the future might look like due to advancements in artificial intelligence. Both of those articles, however, focus on the possible implications in auditing.

There is not yet a documented use of pure artificial intelligence for bookkeeping purposes, however, in 2018, two Chinese scientists filed a patent for an artificial intelligence bookkeeping system that can use audio input to perform complex cooperative bookkeeping. (European Patent Office 2018).

It is likely that automation software with the usage of artificial intelligence will be able to perform all bookkeeping related tasks especially when machine learning will get to the point where it is able to improve itself based on repeating (and thus learning) a large number of the same tasks. Even more pressure then will be on accountants to be able to interpret reports, draw conclusions and make decisions as those are not likely to be replaced by machines in the near future. Accounting software will not be able to link the numbers to the strategic goals of a company and its business model (Villanova 2019.)

2.3 Components of automated accounting software

The fact that we talk about automated accounting means that when a company uses some form of modern accounting software, their bookkeeping process runs as a sequence of RPA processes. Automated accounting software is in fact merely an integration of trends and inventions in accounting and banking in a single platform. The degree of automation has increased over time as more application was integrated into the software (Half 2019).

Automated components that are nowadays an industry-standard are among other automated calculations, integrated online banking, and online payments. (Deshpande 2019.) More recent trends that increase the degree of automation are among others the following:

Electronic invoicing (E-invoicing) is an invoicing method, where an invoice is automatically created based on contracts, purchase orders, or goods receipts. Once the invoice is

sent, it goes through a selected e-invoice operator and appears automatically in the recipient's accounting software. The main advantages of using e-invoicing are reduced manual work and improved working capital cash flow due to maximizing the possibility of early-payment discounts. (SAP Ariba.) Since E-invoicing removes the complexity and high costs of different invoicing channels, The EU ordered from April 2019 all public authorities to accept invoices sent through an e-invoice operator. (European Commission).

Natural language processing (NLP) is a system that is able to get needed data from a text and fill this data in predetermined fields. In practice, this means, for example, preparing a transaction based on an invoice that is sent through the software. (Zhou 2017.) The process then looks as follows: an invoice is to be issued to bill a customer. The accounting software used creates the invoice based on a predefined template and automatically fills all information needed such as billing address or business number based on customer register that the invoice is assigned to. The system also fills predefined payment terms. All this information can be modified if needed. The invoice is then sent through an e-invoice channel to the customer. The customer's software by using NPL reads the amount to be paid and the VAT percentage (if applicable) and makes necessary postings. If a company's accounting software has integrated NLP, the invoice processes take significantly less time and are performed with higher precision. (Turol 2018).

Cash application is a part of the O2C process and deals with applying the incoming payments to the correct receivables invoice and to the correct customer. Cash application is a complex task, especially if a company receives payments through various channels and uses different payment operators that take a commission on each payment. Advanced automated cash application, however, is able to match the payment despite complexities such as when one payment is sent for multiple invoices. (McIntosh-Yee 2016.)

2.4 Selected available ERP software for accounting

The consultancy company Gartner publishes every year a comprehensive market analysis of ERP and accounting software available and evaluates how well they serve the market. This analysis is often used by the market players themselves to highlight their position. Companies deciding which software to invest in also use this analysis to make an educated decision. The analysis consists of an ERP market share analysis and a comparison of the ERP systems' capabilities on a so-called Magic Quadrant, where on the x-axis, there is Completeness of Vision (whether the software focuses on needs of niche businesses or on a wide market) and on the y-axis, there is the Ability to Execute (the scope

of tasks the software is able to perform). (Gartner.) The software providers are then categorized as either Niche Players, Visionaries, Challengers, or Leaders as can be seen from Figure 1 below. The closer the provider is to the top right corner, the more suitable for large companies, and the more functionalities are offered. As the figure shows, in 2019 Oracle was the closest to the top right corner followed by Workday, Sage Intacct, SAP, and Microsoft. Oracle has scored the highest for a third consecutive year. (Oracle).

Figure 1. The 2019 Gartner Magic Quadrant for Cloud Core Financial Management Suites for Midsize, Large, and Global Enterprises

The Quadrant shown in Figure 1 rates the main market players worldwide and is thus not region-specific. Based on Gartner's market share analysis in Europe, Oracle with ERP hold about 50% of the market with Microsoft capturing a significant growth in recent years. (Decker & al. 2019.) Other players hold only a small percentage in the European market and will thus not be discussed further in this literature review.

2.4.1 SAP ERP and Finance

The SAP product to support bookkeeping processes is a part of the SAP ERP & Finance product. For the O2C side of bookkeeping, there are Billing and Revenue Innovation Management which provides integrated revenue management by automating recurring billing. The system supports businesses of any scope with different billing methods. It ranges from basic functions such as automated invoice creation and a summary of payments to

applying discount algorithms. The system oversees that the billing is done according to customer contracts and company policies. The system generates financial reports based on the receivables. The automated flow of data is another crucial advantage. (SAP.)

The P2P side of bookkeeping is supported by the SAP Financial Closing Cockpit. In the A/P processing SAP, for example, enables data from the warehouse about the receipt of goods automatically triggering accounting posting without any actual communication between those 2 departments. (SAP).

SAP as a company based in Germany is traditionally preferred by European companies because the logic of processes follows locally established accounting practices. The most typical customers are large manufacturing firms with global operations and a wide network of suppliers and customers. Finland's Metso and Outotec are among SAP customers. Worldwide, SAP is used by some of the largest companies in various industries such as Unilever, Siemens, BASF, Daimler and Volkswagen Group. The focus of SAP users is mainly on an easy data flow and cooperation between inbound/outbound logistics and accounting. (SAP.)

2.4.2 Oracle Accounting Hub

Oracle also integrates accounting into its ERP software and highlights that their software is suitable for enterprises of all sizes since it is able to adapt to new processes and 'grows' together with the company. Oracle promises to ensure continuous compliance with reporting requirements, elimination of errors, and provides support for audit and reconciliation. Information is easy to find with a complete overview. All of this helps to transform bookkeeping into exception management and drastically reduces manual data input and account matching. (Oracle.)

Oracle supports especially well businesses with operations in multiple countries as it can support multiple ledgers, currencies, and accounting standards. Compared to SAP, Oracle is more customizable and adjusts to different scopes of businesses. Thus, it is preferred (however not exclusively used) by service firms and smaller manufacturers. (Oracle.)

For smaller businesses, Oracle operates the NetSuite accounting software that was acquired in 2016 and is now an integral part of Oracle's ERP software. (Konrad 2016). NetSuite's Order Management together with SuitBilling and Revenue Recognition serves the

O2C process. The main advantages are said to be eliminating errors and boosting the efficiency of the process. (NetSuite.)

2.4.3 Popular software in Finland

As mentioned earlier, Finland is an advanced country in using technology and software in business processes, which also mirrors in the wide usage of various accounting software. The very first accounting software developed in Finland was Tikon, software developed by the company Tietokolmio, nowadays Accountor, in 1979. Tikon was initially only used for payroll services with more financial management functions added in the 1980s. The software has since been updated regularly with new features to keep up with users' demands. The software, however, will cease to exist at the end of the year 2021. (Finago.)

The company Accountor also developed a modern solution **Procountor** for automated financial management. Procountor automates all basic tasks of bookkeeping while maintaining good practices such as segregation of duty through limiting user rights. Procountor is highly customizable by giving the possibility to integrate additional features (e.g. group invoicing, contract invoicing, or dimension-specific limitation of user right). Due to this customizability, the software can 'grow' with the company as the needs and financial possibilities increase. Procountor also offers integration with various third-party applications such as online banking or e-invoice channels. (Finago.)

EFina by **Administer** is used mainly by accounting companies and small businesses. Additionally, many public agencies and municipalities in Finland are Administer's customers (e.g. Länsimetro) The software is actually based on Microsoft Dynamics AX. Administer is praised by its customers for very easy invoices handling and integrated services of a collection agency to deal with overdue receivables. (Administer.)

The Norwegian company **Visma** is another provider of ERP and accounting software and offers customizable accounting services for different countries (specializing in Nordic countries and Baltics). The accounting software for Finland is called **Netvisor** and as opposed to the two previously mentioned runs only in Finnish. (Visma.)

2.4.4 Advantages and disadvantages of current accounting software

Apart from advantages for companies and their business processes, automated accounting software brings positives for the single employees as well. Using integrated software

for accounting enables an instant access to master data about customers, suppliers, customer contracts, or the status of an order, etc. which leads to less time spent on looking up this information and reduces the chances of errors. Accounting software also provides enhanced data security and the system is able to categorize data on its own so that they are organized and only the right people have access to corresponding data. (The Siliconreview 2016.)

When it comes to the demands of specific knowledge for employees, there are both positives and negatives. For example, the requirements for the knowledge of accounting standards or following best practices are much lower since the software is able to 'prescribe' the best practices and comply with the standards required. (Scheer & al. 2004, 8). Similarly, by integration of segregation of duty, fraud can often be avoided. The employee who enters master data about a supplier does not have the right to send a payment to this supplier etc. (Bridgwater 2018.)

However, the disadvantage lies in possibly increased requirements for their skills, especially when a company implements a new ERP and re-training, changing ways of working, possibly even changes to the scope of work are required. In fact, the lock-in and transaction costs that occur once a company implements one ERP also exist for employees if they only have experience with one type of software, that might limit their chances on the job market and make a transition to a different job difficult. (The Siliconreview 2016.) A summary of advantages and advantages is presented in Table 2 below.

Table 2. Summary of Advantages and Disadvantages of accounting software

Advantages	**Disadvantages**
Integration of all business units	Demands on employees to learn using the software and change ways of working
Easy flow of information and data	Lock-in for employees used to working with one certain software
Less time spent on daily tasks	
Fewer errors occur	
Better security and organization of data	
Segregation of duty	
Best practices easy to follow	

2.5 Conclusion

Automation of accounting, despite being discussed a lot in recent years is actually an old practice, dating back to the 1950s. Early computerized software evolved into spreadsheet programs and powerful ERP systems. Currently available software introduces even higher degree of automation to serve the needs of today's global businesses. Automaton helps with information flow between different business units and eliminates routine tasks such as the creation of invoices or recording transactions.

The currently available software is very powerful but comes with challenges such as a high cost of implementation or high demands on employees to retrain themselves to use the software implemented by companies. Even within a single company, multiple software can be used either intentionally by using the so-called Tier system or as a by-product of growth through acquisitions.

When it comes to the impact on employment, many sources agree that the role and responsibilities of bookkeepers', similarly as other accountants have shifted from manual recording of transactions and data processing to utilizing various accounting software, managing exceptions and interpreting the results in a way that make them a good basis for decision making. From the literature review it does not seem that bookkeeping as a discipline is disappearing but rather the scope of tasks is changing. The recent developments in automation bring both massive opportunities but also challenges not only to the companies, but also to employees.

3 Empirical part

This chapter presents the research methods and results of the primary research conducted. Firstly, the selected research methods are introduced and with the description of how they were used to answer the IQs. Further, result analysis is presented visually using figures followed by comments highlighting the most interesting findings or findings that go against initial assumptions. The results are presented by topics to answer the IQs. The chapter ends with a conclusion that summarizes the findings and serves as a basis for the discussion part.

3.1 Research methods

The research method selected for this thesis is a mixed research method called Embedded Design. Embedded Design combines quantitative and qualitative methods to get a deeper and more complex understanding of a topic. (Creswell & Plano Clark 2007). The data collection methods were a survey and interviews. The survey provided primary data, which was then analysed quantitatively. Semi-structured interviews were then conducted to provide more context and objective perspective on the data. Figure 2 below summarizes the steps taken in this research project and their linkage to the IQs.

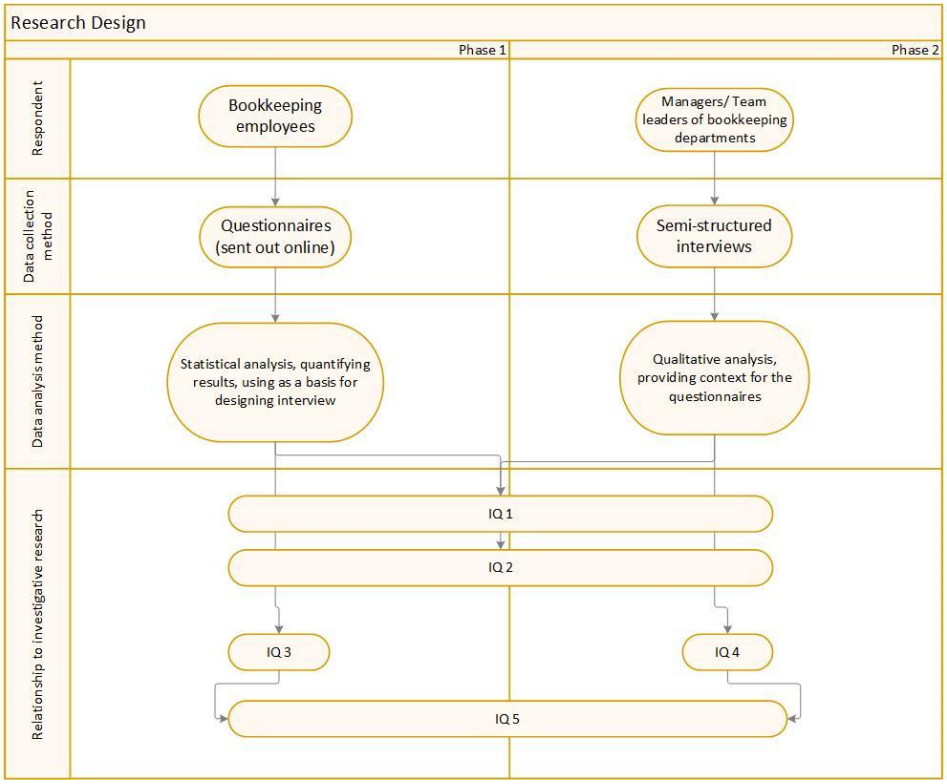

Figure 2. Research Design

Using only the survey might have generated confusing results with conflicting answers. This could have caused the data would be difficult to interpret. In the result analysis, the data is presented so that results from the survey are presented first, followed by relating comments from interviewees.

3.2 Survey

The aim of the survey was to map out the experience of bookkeepers with using accounting software focusing on opportunities and challenges of current software that bookkeepers use. Further, the survey aimed to find out how did the bookkeepers learn to use the software of their company. A minor focus was put on how respondents' studies match the requirements of their job.

The survey was self-completed and sent out online to the respondents. This type of survey is well suitable if potential respondents are geographically dispersed and with limited time resources. (Saunders & al. 2019, 506.)
The survey was created based on the IQs with the help of the quantitative research methods clinic provided by Haaga-Helia. The clinic helped mainly with the neutrality of questions and to prevent leading wording of the questions. Webropol was used as the tool to create the survey. This tool ensures the anonymity of respondents and data privacy.

To ensure a high chance of respondents filling the survey and receiving enough data for the analysis the survey was designed according to Saunders & al (2019, 506) to include the following:

- A clear statement about the purpose of the survey at the beginning of the survey
- anonymity was ensured
- the survey was designed so that it only takes a maximum of 5 minutes to complete with minimum open questions
- No question was set as mandatory

Prior to sending out the survey, a pre-test was conducted with 2 bookkeepers in person. The aim of a pre-test is to ensure that misinterpretation and confusion over the questions does not occur during filling the survey. (Pew Research Center). The participants were

asked to fill the survey while encouraged to think out loud and in to interpret how they understand the questions. Some wordings of the questions were then changed based on this pre-test before finalizing and sending out the survey.
The survey was open for answering for approximately two weeks from the day of sending out. The period for answering was between 30th March and 11th April.

The survey aimed to answer IQs 1, 2, 3, and 5. Table 3 below presents the questions in the survey with a description of the type of question and how they relate to the IQs. The whole survey can be found from Appendix 1.

Question 1 was aimed to ensure only responses from bookkeepers are collected since companies adopt various position and department names. Therefore, the survey opened with position specification, and the results were then filtered to show only the responses from bookkeepers or those who perform more tasks including bookkeeping. Questions 6 and 10 were mainly included to gain more information about the respondents.

Table 3. Survey Questions and their relation to IQs

Survey Question	IQ	Type of question	Reasoning
2. Which of this software have you used as a part of your job?	1	Multiple choice of most common options based on literature review + open field for other answers	Determining the validity of the literature review, how many different systems each respondent has used
3. To what extent can you see the following benefits of using accounting software in your job?	2	Evaluating benefits listed on a scale (not at all-somewhat-a lot). Benefits listed based on the theoretical framework + open question (other:)	An open question would provide less data, respondents might not list as many
4. Has using the software had any negative effects on your work?	2	Multiple choice, options listed were based on the theoretical framework	As oppose to question 3, here not that important the extent but whether the respondent has encountered any of the negative effects
5. How did you learn to use the current accounting software of your company? (you can select multiple)	1,6	Multiple choice, options based on most common ways of learning to use software at the workplace	Finding out the common practice of how employees learn to use the software at the moment and whether they receive support from their employer
6. How long have you worked in accounting?	3	Select one (scope: under a year, 1-3 years, 4-10 years, over 10 years)	Pre-selection of respondents for question 7

7. To what extent do you agree with the following statement: 'My daily tasks differ compared to when I started my job due to the usage of accounting software'	3	Select one (degree of agreement)	Capturing change in a bookkeeper's job due to the software. This question only showed to those working at least 4 years in accounting based on question 6.
8. Was accounting part of your formal education?	5	Select one	Pre-selection for question 9
9. How well in your opinion did this formal education prepare you for your current job?	5	Select one (scale)	Finding out respondents' opinion about the suitability of their studies for their current job
10. What do you wish to have learned in terms of accounting before starting your job?	5	Open question	Additional details, voluntary question

3.3 Reliability of data received from the survey

The reliability of the data is ensured partly by the validity of the respondents and party by the number of responses received. The survey was not made public but instead sent to potential respondents through two main channels:

- directly to those matching the demarcation criteria via LinkedIn direct messages
- indirectly through heads of accounting departments of companies, where I pre-negotiated this possibility.

The companies, where the survey was sent out indirectly included the headquarters of Skoda and Siemens Shared Services Center (specifically the teams taking care of A/R and A/P for German-speaking countries and Central + Eastern Europe), both located in the Czech Republic. Further, to a multinational logistics and warehousing company P3 operating in multiple European countries. The software those companies are using is reflected in the results, Siemens and Skoda use SAP as their ERP and partially internally developed software and P3 uses Oracle.

I was able to reach those companies partly through my personal network or due to my previous work experience. Due to the COVID-19 situation, all of the respondents contacted worked from home at the time the survey was open and some were on unpaid

leave. I was warned by the heads of the departments that this fact could significantly decrease the number of respondents since those on unpaid leave are not obliged to look at their emails daily and also the willingness of answering can be lowered due to this situation.

In total, the survey was sent out to over 300 potential respondents. The survey link was opened 123 times and 92 respondents filled the survey. The responses obtained were filtered further to analyze answers only from people in bookkeeping positions. This resulted in 83 responses that served as a basis for the result analysis.

3.4 Interviews

In addition to the survey, two interviews were conducted in order to provide more context for the survey results. The interview method chosen was semi-structured interviews. This method is suitable when the interviewee has much broader knowledge than the interviewer because it allows asking about predetermine topics but also leaving space to explore the topics in such depth as proves necessary during the interview. (Saunders & al 2019, 437).

The interviews were conducted after obtaining the results of the survey using Microsoft Teams. During the interviews, both interviewees were asked to comment on three main areas to answer the IQs:

1. What advantages and disadvantages can you see your employees experience with using accounting software (answering IQ 2)
2. How would you describe the development of automation in recent years (answering IQ 3)
3. Are there any tasks that are currently impossible/inappropriate to automate (answering IQ 4)

Sub-questions were asked for each of those topics based on the interviewees' experience and expertise, adjusting the length of time spent on each question based on how much the interviewee could tell about each topic. Next, the interviewees were shown the results of the survey (graphs) and were asked to comment on those results and whether or not the results match their experience. The interviewees did not give consent with recording, because they also shared sensitive information about employees and company strategy. Thus, only notes were taken during the interviews into a prepared form that can be seen from Appendix 2.

The answers were analysed qualitatively based on so-called Grounded theory. This approach means exploring interactions and providing theoretical explanations based on empirical knowledge. It is especially suitable for areas where there has been a significant change in the field. (Grbich 2013, 79-81.)

3.5 Interviewees

The first interview was conducted with Leena Joki, the head of Services Center at Hartela Oy, a major Finnish building company with operations in Finland and abroad. The company keeps its accounting operations inhouse and has recently undergone a major restructuring by implementing RPA in their accounting processes. The company does not use any of the mentioned ERP software providers due to financial reasons. Also, the scope of operations does not currently require such a solution. Instead, the company utilizes various external accounting software (for example Palette for the AP automation) while also developing its own RPA in cooperation with ENFO, a company specializing in supporting their customers in developing customized RPA solutions. (Joki.) Leena Joki has been with the company for 6 years and has been the leader of the whole automation implementation process. She directly supervises 20 employees of the Services Center at Hartela. The interview with Leena was conducted in Finnish and English language.

The second interview was conducted with the head of the shared services center of a major car manufacturer Skoda in the Czech Republic. The interviewee does not wish to be named in this thesis. The interviewee has been with the company for 13 years and was involved in the process of implementing SAP as the company's ERP system. The company does all its accounting in-house in its own services center. This center manages administration including accounting for multiple European countries. The interviewee directly supervises over 80 employees. The interview was conducted in the Czech language.

3.6 Result analysis

This subchapter presents the results of the survey and interviews combines. The results of the survey are categorized based on the IQs and presented in figures complemented with a comment. Following the survey results, relevant comments and insights from the interviews are presented. Since the survey was used as the main source of data, the results of the interviews are given less space in the report, focusing on the key insights they gave.

3.6.1 Survey respondents

As mentioned above, the number of respondents, whose responses are presented here is 83. Two questions in the survey aimed to find out more about the respondents- how long they have worked in accounting and whether accounting was part of their education. Those questions then also served as a sorting criterium for further questions.

As seen from Figure 3 below, 43% (36 respondents) have worked in accounting between 1 and 3 years, making it the largest group of respondents, while the smallest group has worked in accounting for more than 11 years- 9% (7 respondents). The majority of respondents are thus relatively new in the field of accounting, which had an impact on their capability to describe development in accounting software over time. It is, however, important to note that this question does not necessarily reflect the age of the respondent, as they might have had a different job before joining a career in accounting.

The second sorting criterium for the respondents was whether accounting was part of their education. The question was formulated in such a way that not only education purely in accounting was asked for, but for example degree in business with some courses in accounting also qualified for answering 'yes' to the question. The majority- 79% (65 respondents) studied accounting at a university or a university of applied sciences and only 6% (5 respondents) have no accounting-related education. The full results can be seen from Figure 4 below.

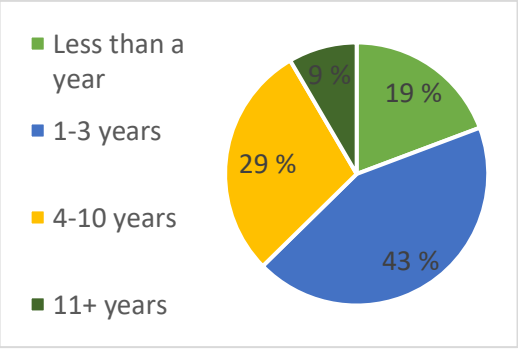

Figure 3. Length of years the respondents worked in accounting.

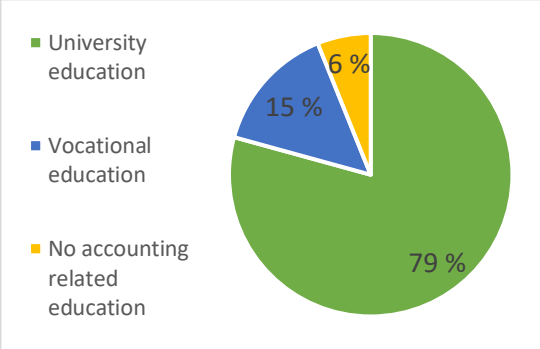

Figure 4. Portion of respondents that had accounting as a part of their education.

3.6.2 Currently available software

The question 2 and partially the question 5 were included in the survey to answer the IQ 1: currently available accounting software. The aim was to find out, which software the respondents have experience with and whether they are familiar with the software that was described in the literature review.

All respondents have answered this question and none of the respondents answered that their company did not use any accounting software. The median number of options selected was 2, showing that accountants, including those who have worked in accounting under 1 year have experience with multiple software. This was a surprising finding, especially as there were many respondents who selected 3 or even 4 software that they have used in their job.

The complete results can be seen from Figure 5 below. The option selected most times was SAP (75%) followed by advanced functions of Microsoft Excel (53%). This result is aligned with the assumption that those are the most common systems used. However, also some of the Finnish software providers scored relatively high, with the least selected being eFina by Administer.
25% of respondents selected the option Other as well, however not all respondents filled the optional open field. Those who did fill the open field mentioned the following software (in order of number of times mentioned) Scala, internal company software (both 3 mentions), Sage Intacct (2 mentions), Duel, Waveapps and Microsoft Dynamics (each 1 mention).

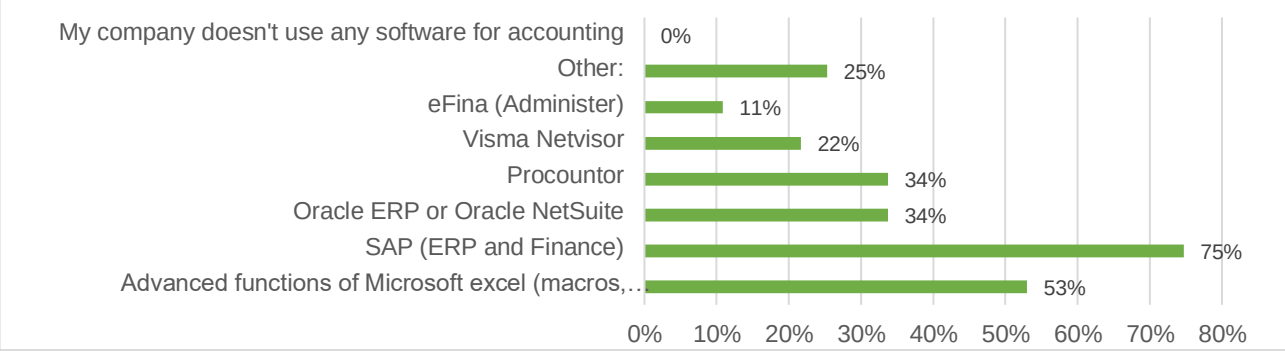

Figure 5: What accounting and ERP software have the respondents experienced as a part of their job

Additionally, in question 5 the respondents were asked how they learned to use the software of their company. This question was aimed to find out the respondents' experience, company practices, and also how many of them learned to use the software at school/university. Only 14% claim they learned to use the software at school/university. Overall, the median number of options selected was 3. The option selected the most times (69%) was learning the software on the go while using it, however only once was this option selected as the only one by a respondent, all the others selected this option in combination with at least one other. The score of other options can be seen in Figure 6.

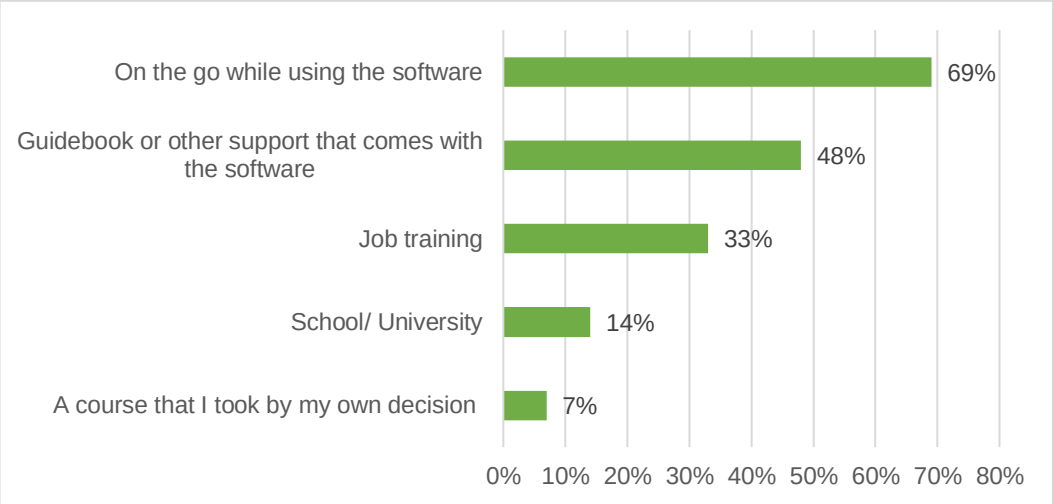

Figure 6. How did respondents learn to use the accounting software of their company

In conclusion, based on the survey, most respondents learned to use the software on the go while using it in combination with another method, usually a guidebook or other support that comes with the software or on a job training. University or another form of education outside the workplace is the least common way of learning to use the software.

Both interviewees said that when the new software was implemented, the company provided intensive training for the employees, but unfortunately this was not available for employees who joined the company later. There is time reserved for some induction into the software during employee onboarding but the experience has been such that employees grasp the software best while using at and the heads of departments allow for new employees to take more time to learn. Leena Joki from Hartela has seen a lot of value in developing their own accounting software together with the employees, this way the software is according to her more likely to serve the purpose and the employees might find it easier to learn to use it.

3.6.3 Advantages and disadvantages of available software

Questions 3 and 4 in the survey aimed to answer to what extent do the users of the software experience the advantages researched by the literature review and which disadvantages (if any) does the software have in their work.

In question 3, respondents were asked to evaluate to what extent they can see the advantages listed, the options being ‘not at all’ ‘somewhat’ and ‘a lot’. All respondents evaluated each of the advantages. The score for all options listed is shown in Figure 7.
Out of the options listed, ‘minimal manual work’ and ‘easy access to all data needed’ received the highest score by the respondents. This result is aligned with the assumption that those two benefits have historically been the main reason for developing and implementing automated accounting software.

An interesting finding was that even though most of the companies that the respondents work for, need to prepare their financial reports in compliance with IFRS, the option ‘comply with IFRS and other regulations’ was by 54% of respondents marked as ‘not at all’ being a benefit and received the lowest score overall. It shows that the survey mapped out the subjective feeling and advantages single employees experience, rather than which advantages, a company as a whole, experiences.

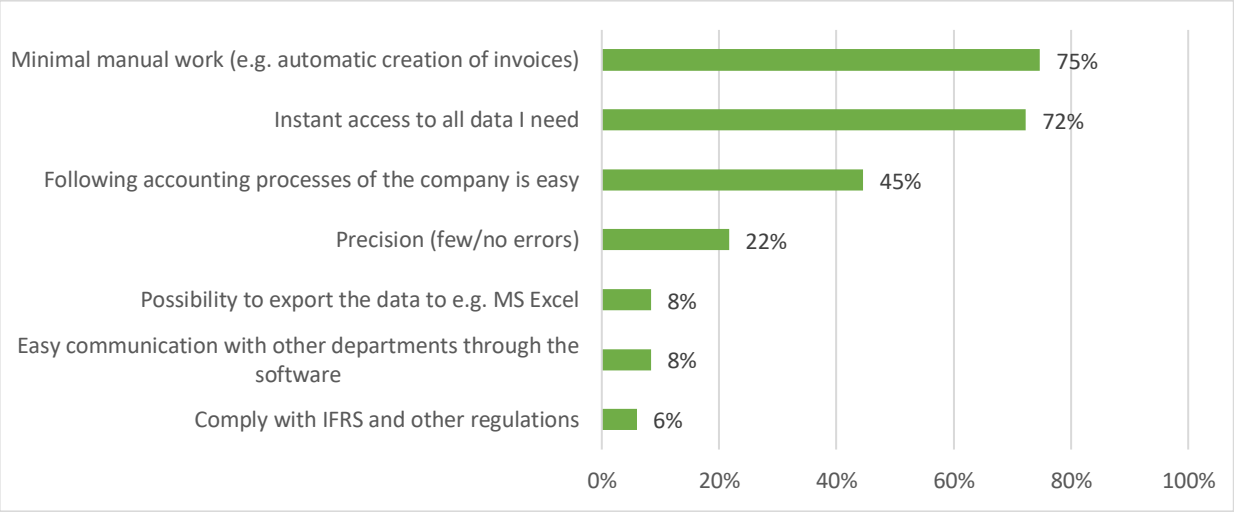

Figure 7: Benefits of accounting software and the percentage of employees who see them a lot in their jobs

The interviewees did see all the same benefits as the respondents. They did mention the time saving and lack of errors as the significantly main advantage. The interviewee from

Skoda said that from their perspective, the major advantage is the smoothness of A/R and A/P processes that is enabled through using SAP. The other advantages then derive from this aspect- fast and precise process translates into less time spent on the daily tasks and fewer errors.

Leena Joki from Hartela then saw the dramatic decrease in errors as the main advantage and that the role of the employees has significantly shifted from booking transactions to managing exceptions. She can also see improvement in employees' wellbeing because they need to spend less time at work and the work is less stressful and demanding. She, however, named the possibility to export in excel as a major advantage and shared an example that their software creates excel exports where transactions that include a mistake are marked in color. This decreases time to tracking mistakes to nearly 0.

When it comes to the negative effects on their work, all respondents selected at least one option in this multiple-selection question and a median number of negatives selected by one respondent was 3. Clearly, the most selected option was 'it doesn't have all the functions I need' with 66% of respondents selecting this option and secondly 'I need to use multiple software for different functions' with 53% of respondents. Interestingly, the group of respondents working in accounting for up to 3 years selected those options even more frequently than those working in accounting for longer. Figure 8 below shows the complete results provided by this question.

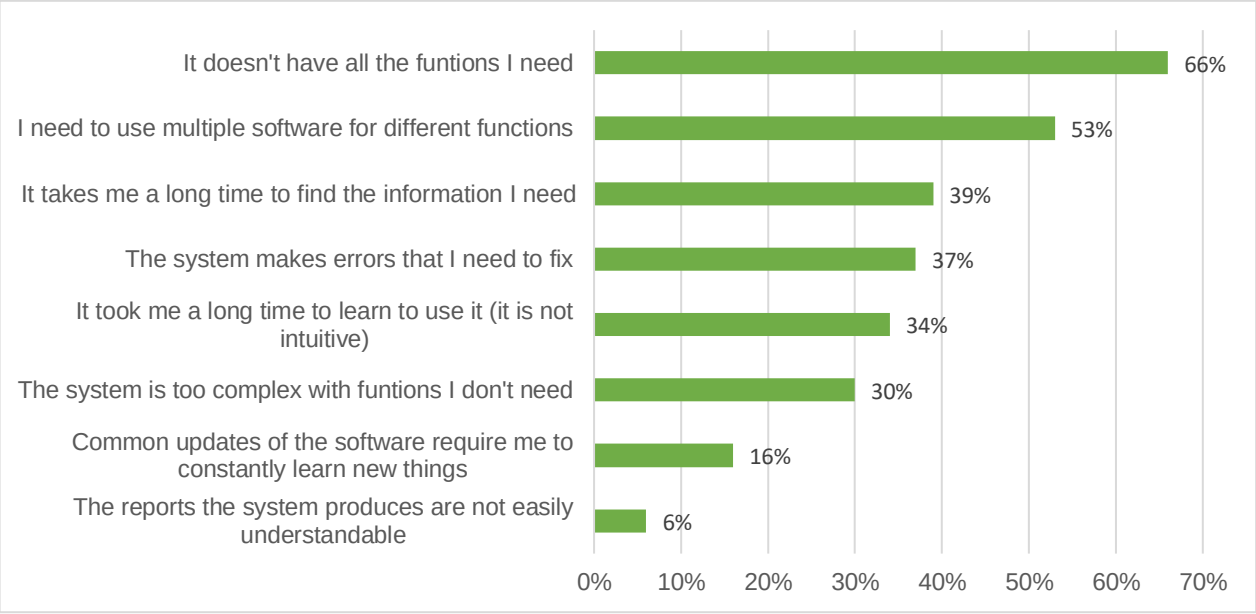

Figure 8. Negative effects of accounting software

Analyzing these responses further based on the specific software the respondents use revealed that 81% of respondents who use SAP claim that it does not have all the functions they need. In comparison, only 57% of respondents who use Oracle selected this option. This goes against the assumption that ERP systems implement much more functions than accounting software. The other options did not differ so dramatically when filtering based on the software. Filtering this questions based on users of the smaller software providers (Procountor, Administer and Netvisor), and comparing it with Figure 8 above showed the same or higher % in all of the options showing that users of the software purely intended for accounting purposes see more negatives than those who use ERP software: SAP or Oracle.

Leena Joki, when asked if she can see any negatives could not recall any and the only thing she mentioned was that the software cannot be used to its full potential since not all customers and suppliers are integrated into the electronic accounting network and some customers still wish to be sent paper or email invoice. Therefore, some tasks take still longer than necessary. The other source of the disadvantages from her perspective is that unfortunately, there is not enough time during employee onboarding to give them all the assistance they would need to learn all the functions of the software, which she sees as a possible reason why the survey respondents saw quite many negatives in the software.

The interviewee from Skoda said their company 'battles' with the employees mastering the software. The employees come to the work usually not equipped with the skills needed, especially when it comes to fresh graduates. The company runs its own university, where they can tailor the education to fit the needs of the jobs, but not all employees come from this institution. The company tries to provide the necessary training, but the training organized by SAP itself comes with a very high cost and the one from other organizations comes in her experience short in quality. The motivation of employees to participate in those is another issue. This interviewee confirmed the results of the survey and said they are often met with those negatives; however, the advantages of the accounting processes prevail.

3.6.4 Development over time

In the survey, the question mapping out the development over time was asked only from respondents who have worked in accounting for longer than 4 years. The number of respondents falling into this category was only 31, which might decrease the validity of the

data. The development over time is a complex topic and it would be difficult to capture it only through the survey without making it too long. Therefore, question 7 in the survey served more as a basis for designing interviews and to get a general idea about how employees feel regarding the development. Respondents were asked to evaluate to what extent they agree with the statement 'My daily tasks differ compared to when I started my job due to the usage of accounting software'. The answers ranged on the whole spectrum, but 74% respondents either strongly or somewhat agree. The full distribution of answers can be seen in Figure 9 below. The assumption for this question based on the literature review that showed that automation to some extent has been in the industry for decades was that respondents would be much more reserved in a sense that they would select less direct answers such as 'somewhat agree' or 'neither agree nor disagree'.

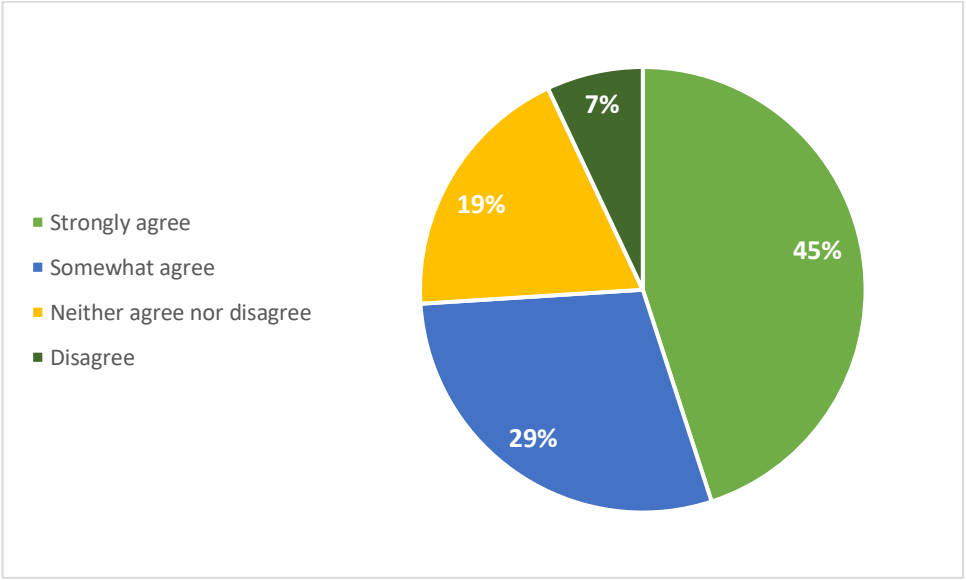

Figure 9. To what extent do respondents agree with the statement 'My daily tasks differ compared to when I started my job due to the usage of accounting software'

The interviewee from Skoda said that in her 13 years of experience, the processes of the company transformed significantly. This could be observed also because of the decision of the company to keep accounting inhouse. The interviewee described the change as 'the software made the bookkeeping processes much clearer as to what is the next step at any stage of the process. This caused the work, in general, to be much clearer and less hectic. Since the time spent on daily manual bookkeeping has decreased to a minimum, there is more time that can be spent on revealing errors and correcting them.

Leena Joki, despite being with the company Hartela for only 6 years has also seen some major changes and in her experience, the increase in automation has led to increased employee well-being. There is less need for overtime and errors are revealed sooner, meaning the error can cause less damage. She added that now the automation and artificial intelligence are showing growth in capability at an unprecedented speed and that the next few years might be very transformative for the field.

3.6.5 Tasks inappropriate to automate

This question was only asked from interviewees and was excluded from the survey since it would need to be an open question and that would not yield enough answers to draw conclusions from. After asking this question, I observed that both interviewees took a long time to answer, possibly because it was hard to think if there is any such task.

Quoting Leena Joki directly on her answer 'Everything that you do with a mouse click on a screen can be already today automated', regarding bookkeeping she did not come up with any specific task impossible to automate. She said that in business controlling there is much more space for drawing conclusions and adjusting processes and there she could see some tasks, but since bookkeeping is a regulated and commonly established process, it is subject to heavy automation. The reason then that the whole process is not automated yet lies in the fact that the network of customers and suppliers uses automated to various degree so this exception managing takes the majority of the manpower. Leena predicts, that as the software becomes increasingly powerful, those cases will become even less common.

The second interviewee had more or less the same view and said that as their team handles transactions with different countries, they also have different amounts of manual work that needs to be done. And that also differs based on the size of a supplier/customer. Even though SAP is customizable, it has its limitation in her opinion.

3.6.6 How studies prepare for today's accounting jobs

Respondents who answered in question 8 that accounting was part of their education were then further asked to evaluate, how well did this education prepare them for their current job. The options were only three to avoid confusion, those being 'prepared me well' 'prepared me for some aspects' and 'didn't prepare me at all', The hypothesis with this question was that most respondents will go for the 'neutral' option and indeed, 75% of

respondents selected that their education prepared them for some aspects of their job. However, fewer people then selected the option ‘it didn’t prepare me at all’ (17%) than ‘it prepared me very well’ (8%).

When filtering the data based on their years of experience, it revealed that the shorter people have worked in accounting, the more critical they are about their education. In fact, 66% of those working in accounting for less than a year claim that their education did not prepare them at all for the job and only 7% said it prepared them very well. On the other side of the spectrum, none of those with 11+ years of experience selected the ‘it didn’t prepare me at all’ option and 50% said it did prepare them well. The comparison of answers differentiating among experience levels can be seen from Figure 10.

It is important to note that many variables play a role in the results. The respondents could only reflect on their subjective feelings towards their education and even though they all had some form of university education, we cannot know the exact institution they received the education from. Finally, an important aspect is that the outcome people get from their education much depends not only on the institution itself but also on the effort the students themselves put in it.

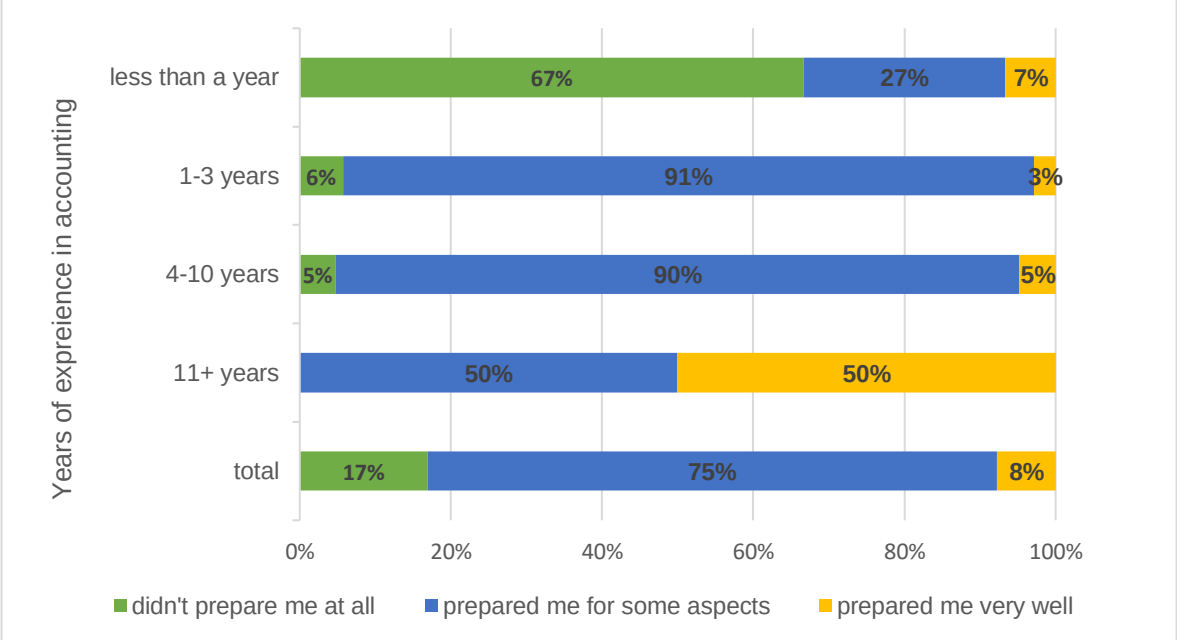

Figure 10. How well did their formal education prepare the respondents for their current job

The final question was an open question where respondents were asked what they wish to have learned prior to starting their job in terms of accounting. 18 respondents answered this question with the following results:

- 6 answers were directly related to accounting software- either the respondents did not learn about any accounting software at all or they did not learn about the exact one their company uses
- 5 respondents mention learning more about accounting processes on top of single tasks, with multiple respondents mentioning they would have liked to know how accounting fits in the context of other company processes.
- 4 answers were related to learning what is ERP and how it is used for accounting.
- 1 respondent wished to learn more about cooperation between accounting and supply chain
- 1 mentioned the excel skills he gained at university were not enough for his work-place.

These results, together with results in question 5 show that many respondents feel there is a gap between university studies and their job requirements in terms of lack of focus on learning about different accounting software and how to use specific accounting software. This gap was also mentioned by both interviewees.

3.7 Conclusion

The validity of the data provided by the survey is limited by the number of respondents, the findings cannot thus be applied to the entire field. In the same way the interviewees can mainly speak about the experience from their companies. Those two research methods combined did, however, provide some interesting outcomes and insights into the field. The automation clearly has a significant impact on the employees' daily job and the whole accounting processes. According to the interviewees, there are almost no areas of bookkeeping left that would not be affected by automation and that the accounting software would not be able to perform.

All respondents have had experience with using multiple accounting software as a part of their job, even though only 14% claimed that they had learned to use the software at the university. The majority of respondents believe, however, that their education prepared them well or at least for some aspects of their job in accounting. While the respondents

reflected both advantages and disadvantages that the software has on their daily jobs, the interviewees saw only the positives when talking about the tasks itself.

The answers rarely differed between the interviewees, despite coming from different countries and industries. The survey respondents' answers did rarely show a clear trend and usually varied on the whole scale of options given. The answers then differed also based on the respondents' years of experience in accounting and educational background.

4 Discussion

This chapter summarizes the key results of the thesis in answers to the IQs 1-4 set in chapter 1. Further, the reliability and validity of the research are discussed, including the ethical perspective. The IQ 5 is answered in its own subchapter as it aimed to give recommendations to Haaga-Helia as an educational institution based on the research findings. Finally, own learnings gained throughout the writing processes are described.

4.1 Key results

Both, the literature review, and empirical research indicate that the job of a bookkeeper has not yet disappeared and will not in the near future, despite increasingly powerful software being available. The scope of tasks and job requirements might, however, differ significantly in the future. Automation in the form of accounting software has had a significant impact on the way bookkeeping is done in companies, with this impact increasing even further in the upcoming years, especially due to the advancements in artificial intelligence.

IQ 1. Which automated accounting software is currently available and how do employees learn to use it?

Large multinational companies are best supported by well-established providers of integrated ERP software such as SAP and Oracle. The majority of the respondents (75%) have used SAP in their job. Smaller companies or companies utilizing the Tier-system are better served by task-specific solutions. Another possibility used for example by Hartela oy is developing their own RPA for bookkeeping.

The most common way for the respondents learned to use the software was on the go while using it- this was mentioned as at least one of the methods by 69% of respondents, however, nearly all of the respondents selected at least two methods that helped them when using the software. Learning on the go when combined with other, more focused methods, was also confirmed by the interviewees as the most common and most effective option.

IQ 2. What are the advantages and disadvantages of those systems considering the quality and scope of accounting tasks they can perform?

For the respondents, the most highly rated advantages were minimal manual work and instant access to all data. In this question, the most interesting finding was the conflict between the advantages for employees versus the advantage for the company and its overall processes, as seen for example by very few respondents selecting the advantage of

compliance with IFRS. While every respondent selected at least two negatives they can see with using accounting software, the interviewees could hardly think of any and saw the usage of accounting software as purely positive for the employees, naming mainly removing tedious manual tasks, saving time and removing errors

IQ 3. How has the nature of bookkeepers' job changed over time due to the usage of such systems?

This extensive question was difficult to capture by surveys, however, 45% of respondents who have worked in accounting for over 4 years strongly agreed that their job has changed since the time started due to the usage of accounting software with 29% somewhat agreeing to the same statement.

Also, the interviewees have seen significant development recently, predicting it will be even more visible in the upcoming few years. The interviewee using smaller accounting software together with internally developed RPA could see a larger change than the interviewee whose company uses SAP.

IQ 4. Which bookkeeping tasks are currently impossible/inappropriate to be automated and why?

According to the interviewees, bookkeeping as an accounting discipline has been subject to high-degree automation in comparison to for example business controlling. Neither interviewee could come up with a specific task that is not automated and talked in more broader terms that there is still the need to manage exceptions and deal with transactions related to suppliers/customers not fully integrated into the automated accounting landscape.

4.2 Reliability and validity

The theoretical part was written using a wide range of sources, including multiple book sources and peer-reviewed articles. This meant multiple perspectives were brought up for the topic while making sure the theories remained within the demarcation.

For the primary data collection- surveys and interviewees, the participants were selected carefully so the research brings relevant data. Even though hundreds of potential respondents were contacted, only 92 actually filled with the survey. The validity of the data is thus affected by a lower number of respondents. The results can in no way be taken as representative of the industry as a whole but only show some possible trends. Much more

extensive research would be needed in order to receive results of higher reliability and validity.

From the ethical perspective, all participants were informed about the purpose of the research, and the data provided by them shall be used for this thesis only. The answers provided by the survey respondents were anonymous. The interview participants' wish to not record the interview was respected; however, this might have an impact on the validity of the data gathered.

4.3 Recommendations

Being able to work with at least one accounting or ERP software is an industry standard as shown in the literature review, survey results, and interview answers. In order to succeed in accounting, the employees need to know how to use at least one, but more often multiple accounting software. It is likely that employees will more than in the past need to update their skillset based on the technological advancement in the industry.

The majority of the respondents did not feel like their education prepared them very well for their job, so there is still an opportunity for educational institutions to implement more usage of various accounting software in their courses. The interviewees also confirmed this would help employees in their jobs and increase applicants' chances of being selected for job openings in their companies.

Haaga-Helia could introduce a variety of ERP and accounting software into the courses. The automation in the industry could be discussed more. During my studies, I have never encountered terms such as RPA and how it translates into accounting, even though this a standard practice in the field and having at least a theoretical background might lead to a faster work induction.

4.4 Reflection on learning

The thesis process was very challenging but also highly rewarding. The process of writing taught me four main aspects that I will be able to utilize not only in my future studies but also in my career.
Firstly, I had to learn to research relevant literature and read from a large number of sources related to the topic- academic articles as well as case studies from the field. Addi-

tionally, I had to use my judgement regarding the relevancy of various sources for this research. I learned a lot about a topic I am personally interested in and that might help me in my job.

Secondly, I learned a lot about different research methods both theoretically and how to apply those in a research project- I conducted my very first survey from the initial survey design, to data collection and analysis.

Thirdly, I had to utilize my network and contact potential respondents and interviewees. For this, I had to use different channels, such as email, phone, or LinkedIn, and work on my professional communication to increase the chances of response.

Finally, I learned to work on a single project for multiple months, and all the skills related to that such as time management, planning and sequencing of work and self-commitment, and accountability to a project.

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Appendices

Appendix 1. Webropol survey

Which of the following best describes your role? (choose one)

- Bookkeeping (handling invoices, recording transactions, Accounts receivable/Accounts payable)
- Financial reporting: preparing financial statements and other reports
- Business Controlling: overseeing costs, budgets, pricing,...
- Other accounting or financial function
- A combination of two or more functions mentioned above

Which of this software have you used as a part of your job? (possibility to select one or multiple)

- Advanced functions of Microsoft Excel (macros, complex functions)
- SAP (ERP and Finance)
- Oracle ERP or Oracle NetSuite¨
- Procountor
- Visma Netvisor
- eFina (Administer)
- Other: *open field*
- My company doesn't use any software for accounting

To what extent can you see the following benefits of using accounting software in your job *(Scale: Not at all – somewhat – a lot)*

- Minimal manual work (e.g. automatic creation of invoices)
- Precision (few/no errors)
- Instant access to data I need
- Easy communication with other departments through the software
- Comply with IFRS and other regulations
- Following accounting processes of the company is easy
- Possibility to export data to e.g.MS Excel
- Other: *open field*

Has using the software had any negative effects on your work (you can select multiple)

- It took me a long time to use it (it is not intuitive)
- It doesn't have all the functions I need
- It takes me a long time to find the information I need
- Common updates of the software require me to constantly learn new things
- The reports the system produces are not easily understandable
- The system is too complex with functions I don't need
- The system makes errors I need to fix
- I need to use multiple software for different functions

How did you learn to use the current accounting software of your company (you can select multiple)

- School/ University
- Job training
- Guidebook or other support that comes with the software
- A course that I took by my own decision (outside school/university and without my employer requiring it)
- On the go while using the software

How long have you worked in accounting

- Less than a year
- 1-3 years
- 4-10 years
- 11+ years

To what extent do you agree with the following statement: My daily tasks differ compare to when I started my job due to the usage of accounting software
(note: this question appeared only to those who answered the two last options in the previous question)

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Disagree

Was accounting part of your formal education

- Yes, at a university or a university of applied sciences
- Yes, at a vocational institution
- No

How well in your opinion did this formal education prepare you for your job?
(note: this question appeared only to those who answered Yes to the previous question)

- It didn't prepare me at all
- It prepared me for some aspects
- It prepared me very well

What do you wish to have learnt in terms of accounting before starting your job
Open question

Appendix 2: Interview structure

Introduction of the interviewer, the process and methods

- Introducing myself, the research objective and the progress so far
- Explaining the purpose of the interview for the research
- Outlining the main topics, and the overall process of the interview
- Asking whether the interviewee agrees with the interview being recorded
- Asking whether the interviewee agrees with their name, position and name of the company being included in the thesis
- Informing that notes will be taken during the interview and that the noes can be sent to the interviewee if they wish so, to verify that no misinterpretation occurred.

Introduction of the interviewee

(serves partly as a verification the interviewee is relevant for the research)

- Position description
- How long they have been working for the company
- Accounting practices within the company: inhouse/ outsourced
- How large is the team that they supervise and what are its main tasks

Software used by the company

- Which software does the company use for their accounting (single or multiple?)
- When was this specific software implemented
- How were the employees trained to use this specific software
- Description of the implementation process- how were the employees prepared for it
- Are there any near future plans to change the software

Advantages/Disadvantages of the software used

- What advantages/disadvantages can the interviewees see in regards to:
    - Daily tasks performed
    - Results of the work
    - Overall accounting processes
    - Employees- skill requirements, well-being, job satisfaction, etc.

Tasks impossible/Inappropriate to automate

- Can the interviewees see any bookkeeping related tasks at the moment that are for some reason not automated
- If so, what might the reason for that
- Could that change in the future

Development over time

- What are some aspects the interviewees see have changed dramatically in their position due to the usage of accounting software
- Brief outline of the future: concrete plans by the company/their own predictions

Summary and conclusion

- Giving interviewee the opportunity to add any further comments
- Brief summary of the main points mentioned, to make sure the interviewer understood correctly
- Brief timeline outline- next steps in the research, when will the thesis be ready
- Giving contact details for further questions
- Thanking the interviewee for their time and highlighting how helpful their contribution was.