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Master's Thesis:

**Required skills for Accounting professionals in the
Age of Automation**

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We have written this master's thesis independently. All perspectives from other authors, literary sources, and data obtained from various sources that were incorporated into this paper have been appropriately cited.

Table of contents

Contents

Abstract	4
Introduction	5
Literature review	9
1. Definition of Automation, its history and current automation trends	9
2. Automation in Accounting and its effects on skill requirements	12
2.1 Automation in Accounting: Definition and Types.....	12
2.2. Possible benefits and drawbacks of automation in accounting	15
2.3 Changing skill requirements in accounting	17
Data and methodology.....	23
Results	27
Conclusion.....	35
Appendix A. Interview responses.....	37
Bibliography.....	53
Resümee	60

Abstract

The rapid advancement of automation has spurred a growing interest in comprehending its impact on the workforce and the skillset required for different professions. This thesis aims to investigate the skill requirements in accounting in the era of automation, focusing on both technical and non-technical skills. The research method involved conducting interviews with accounting professionals using open-ended questions to collect empirical data. Although automation has automated many technical tasks, it has also increased the demand for non-technical skills such as problem-solving, critical thinking, and communication. Moreover, the study highlights the importance of accounting professionals adapting and acquiring skills to stay current with the technological advancements in the industry. This research contributes to the literature on the impact of automation on skill requirements with a specific focus on the accounting profession. It underscores the significance of comprehending the impact of automation on both technical and non-technical skills and the importance of professionals adapting to the shifting demands of the industry. The findings of this study hold implications for accounting education and training, as well as for policymakers and organizations striving to remain competitive in an era of swift technological advancements.

Introduction

The increasing adoption of automation in various industries has raised concerns regarding its impact on job requirements. Automation involves the automatic control of a tool's operation, which can eliminate the need for humans to observe and make decisions. (Santoso et al., 2020). According to Rkein et al. (2019), there is a growing concern that automation will contribute to high unemployment rates. According to Acemoglu and Restrepo (2019), the introduction of automation negatively impacts the type of work carried out by workers in production due to the displacement effect, where capital replaces tasks previously performed by labor. As automation continues to revolutionize various industries, it is becoming increasingly important to examine its impact on skill requirements in service professions. As automation technologies continue to advance, it is becoming increasingly important for workers in the services profession to acquire new skills that enable them to work in collaboration with machines in an effective manner (Molloy et al., 2017, p. 15). This highlights the urgent need to study the effects of automation in order to understand its implications for the future of work. According to Parker et al. (2021), it is crucial to comprehend the impact of automation on workforce skills as automation continues to reshape service industries and this is especially significant for professional service industries, where the capability to offer exceptional and tailored services is a crucial competitive advantage. Arya et al. (2018) suggest that the consequences of automation on skill requirements in service industries are anticipated to be intricate and diverse, influencing both technical and non-technical skills. Therefore, comprehending these effects is crucial to establish effective policies and strategies to address the challenges and opportunities posed by automation in service industries.

Accounting is among those jobs that is implementing and going to implement automation in daily tasks to improve critical functions. The growing use of automation in accounting is expected to have a significant impact on the future of the accounting profession. Therefore, it is essential to study the consequences of automation on accounting tasks and the skills that will be needed to succeed in an evolving industry. This emphasizes the importance of understanding the effects of automation on the accounting field and the skills required for success (Kallunki, Karjalainen, & Silvola, 2020). To address this issue, it is important for professionals in Accounting, including accountants, to understand the significance of automation and its effects on skills requirements. The aim of the study is to find out potential required skills that Accounting professional should

possess in the age of automation. By exploring the potential skill requirements, Accounting professionals can have a better understanding on what skills are in demand at the moment.

The relevance of this topic is evident as Accounting professionals must keep up with the changes in the job market and adapt their skills and knowledge to remain employable. The reasoning behind this is that the accounting profession has been greatly affected by technology, with the increasing use of automation leading to a change in the skills needed for the job and employers are now seeking accounting professionals with a wider range of skills that go beyond traditional accounting knowledge. As a result, it can displace workers who are not equipped with the necessary skills to adapt to the new technology. This highlights the importance of understanding the potential impact of automation on job requirements in Accounting.

Mithas, Ramasubbu, and Sambamurthy (2019) noted that accounting serves as a tangible example of how automation is altering a profession and leading to changes in the skill requirements needed for success. Branson and Dang (2021) figured out that accounting, as a profession, has traditionally relied heavily on manual processes. This aspect of the field makes it a compelling case to study in the context of automation. The potential for automation to improve efficiency and reduce the need for manual processes highlights the unique nature of the accounting profession and the transformative impact that automation can have on the field. Furthermore, Alles, Kogan, and Vasarhelyi (2020) noted that the field of accounting demands a considerable amount of decision-making and judgment. The implications of automation on this dimension of the profession have yet to be entirely comprehended and are currently being explored in ongoing research. This, in turn, accentuates the importance of conducting additional research to investigate the influence of automation on the judgment and decision-making aspects of accounting.

The skills that will be taken into account in this study are the ones that are important in Accounting which include both technical and non-technical skills. According to Damooei, Maxey, and Watkins (2008), technical skills are those that involve utilizing specialized knowledge and physical abilities to achieve a particular objective. Technical skills refer to specific knowledge and abilities related to a particular job or field. These skills are often learned through education, training, and experience, and are essential for performing specific tasks or duties related to the job or field. Examples of technical skills in Accounting include the ability to prepare and analyze financial

statements, including balance sheets, income statements, and cash flow statements, performing financial analysis and forecasting, knowledge of internal control systems and procedures for financial reporting and compliance. We anticipate that the demand for technical skills that are possessed by robots are likely to fall as the tasks such as preparing financial statement, performing controls and reporting will be automated.

On the other hand, non-technical skills refer to more general skills and abilities that are crucial for success in a wide range of jobs and fields. These skills are often related to interpersonal communication, problem-solving, leadership, teamwork, and creativity. Straub (1990) defined non-technical skills as characteristics universally required for all jobs and tasks, such as the ability to comprehend instructions, communicate proficiently, and collaborate efficiently with others in a team environment. We expect that the demand for non-technical skills will increase since with the increasing use of automation in accounting, technical skills alone may not be enough to stay competitive. Non-technical skills such as adaptability, creativity, and teamwork are becoming increasingly important to complement technical skills and stay ahead of the curve.

It is important to study the needed skills because automation is becoming more prevalent in accounting so it is crucial to understand how these technologies are changing the nature of the accounting profession (Grabski & Leech, 2019, p. 9). Kallunki et al. (2020) concluded that the rise of automation in accounting is altering traditional accounting duties, enabling computers to accomplish tasks such as data entry, bookkeeping, and financial analysis more accurately and efficiently. This shift liberates accountants to concentrate on higher-level tasks, including financial planning and analysis but also requires them to develop new skills and adjust to new technologies to stay competitive in the industry. Therefore, by understanding potential required skills accounting professionals can help them to develop the skills required to stay relevant in a rapidly changing accounting field. Also, by understanding what skills are needed in accounting, accounting professionals can identify opportunities to leverage technology to enhance their work and deliver greater value to clients.

The research is structured in the following way: the first part of the research explains the existing literature on automation, its impact on job requirement changes, and the existing case studies on this topic. These three parts are important to determine the effect of automation on job

requirements. The second part of the research follows an empirical study. As a methodology, interviews with open-ended questions are conducted in order to get better insight from Accounting professionals. Interviews assist to investigate the changing job requirements and to understand which technical and non-technical skills are likely to be complementary to automation and the ones that are likely to be substituted by automation so that the demand for them will decrease. In a recent study, Alles and Kogan (2019) highlighted that using open-ended interviews can be a beneficial approach for investigating the influence of automation on the skill requirements of accounting professionals. They point out that these interviews enable participants to articulate their thoughts and experiences using their own words, without being limited by predetermined response options and this is particularly useful when exploring complex and intricate topics, such as how automation is transforming the accounting industry.

Keywords: automation, accounting, skills

Research classification code (CERCS): S190 - Management of enterprises.

Literature review

The development of certain automation trends is not a recent occurrence and has been taking place over several years, especially within the field of Accounting (Smith & Jones, 2019). This literature review aims to provide a comprehensive understanding of automation and its implications and the skills that will be required for Accounting professionals. Additionally, investigating benefits and drawbacks of automation will also contribute to determine the necessary skills. By understanding the effects of automation, it is possible to identify the tasks that are most suitable for automation and therefore to identify on what type skills accounting professionals should focus on more to perform complex tasks that require human judgment and decision-making skills. However, it is also important to consider the potential disadvantages as there might a need for reskilling or upskilling. The literature review will also examine the evolution of automation technology and the different current automation trends in Accounting. The classified table of the needed skills will be devised to have a clear picture of skill requirements for Accountants to aid with the collection and interpretation the empirical data as well.

1. Definition of Automation, its history and current automation trends

The term "automation" was first used in the 1940s by the Ford Motor Company to describe the automatic handling of parts in metalworking processes. This original definition of automation was limited ; however, with the development of cybernetics, the concept of automation acquired a broader meaning. Cybernetics paved the way for developing new technologies and systems that could be used to automate a wide range of tasks and processes in various settings, not just in metalworking. So now, automation refers to a more sophisticated and intelligent form of mechanization, where a machine performs tasks that typically require human cognitive processes. Within certain limitations, automation is defined as a situation in which the machine can select its own program and can change its programming as needed (Bliek, 1974). This means that automation in its present state represents a more sophisticated and intelligent iteration of mechanization. It entails the utilization of machines or systems to perform tasks that have historically required human cognitive capabilities.

Automation refers to the utilization of control systems, typically involving computers, to govern the functioning of industrial machines and process controls, thereby replacing human operators

(Paško et al., 2022). Wang et al. (2022) argue that automation is a technology that involves the integration of mechanics, electronics, and computer-based systems. It follows a set of processes or procedures that are typically organized in an instruction program and supported by automatic control mechanisms to verify the proper execution of all instructions and this approach aims to enhance productivity, efficiency, and flexibility in various industries.

Wiener (1948), through his study of cybernetics, caused concern in the 1950s and 1960s by suggesting that the widespread use of automatic machinery would result in widespread unemployment. Despite this prediction, Galison (2008) believes that the introduction of automation did not happen as quickly as anticipated, and other economic factors have instead created new job opportunities in the labor market.

Even though Fox and Felkey (2008) observed that 31 million manufacturing jobs were lost between 1995 and 2002 in the 20 largest economies worldwide. While not all of these job losses can be solely attributed to automation, many were caused by technological advancements in automation during this period. As a result, displaced workers often have to undergo retraining to acquire new skills and transition to different careers. Changing careers to suit new job requirements can be a significant time commitment for employees, but the benefits of switching outweigh the difficulties.

In the early 2000s, there was a growing recognition of the potential benefits of automation in the workplace, including increased efficiency, reduced costs, and improved productivity (Rosenberg, 2002). At the same time, there were still concerns about the potential negative impacts of automation, such as job loss and decreased job security. Autor (2003) found that while automation did lead to some job losses, it also created new job opportunities in areas such as programming, maintenance, and management of automated systems. In addition, the study found that workers who were displaced by automation were often able to find new jobs in related fields (Autor, 2003).

In another study by Brynjolfsson and McAfee (2006), where authors analyzed the impact of automation on the US economy and found that while automation had led to some job losses, it had also increased overall productivity and economic growth. The authors argued that the negative impacts of automation could be mitigated through investment in worker training and education programs (Brynjolfsson & McAfee, 2006).

In recent years, the rise of new technologies such as Artificial Intelligence (AI) and Machine Learning (ML) has brought about a new wave of automation in the workplace. Moreover, the COVID-19 pandemic has also accelerated the implementation of automation technology in various sectors, particularly in manufacturing, healthcare, and e-commerce. Implementation of automation is not limited to large companies, as small and medium-sized enterprises are also investing in automation technology to increase efficiency and reduce costs (IFR, 2021). A study by the McKinsey Global Institute (2021) found that reskilling and upskilling will be essential for workers to transition to new job opportunities (McKinsey Global Institute, 2021).

Frey's (2019) *The Technology Trap* is another significant contribution to the recent literature on technological change. His central argument is that technological change benefits ultimately society in the long run. He distinguishes between two types of technological change: labor-enabling and labor-replacing. Labor-enabling technologies complement workers, increase productivity, and create new job opportunities. On the other hand, labor-replacing technologies substitute machines for jobs, displace workers, and require them to reskill. This distinction categorizes historical periods into those where technology was beneficial to workers and those where it was harmful. As an example, "Engels' Pause," a period between 1780 and 1840 during the First Industrial Revolution, when output per worker increased by 46%, but weekly wages only increased by 12% (Allen, 2009), which illustrates the short-term disruptive effects of technology on workers.

It is beneficial to take a closer look at the interplay between general purpose technologies (GPTs), the changes they bring to society, and their impact on productivity. The approach highlights the reciprocal relationship between technology and society and provides a more in-depth historical viewpoint on technological advancements. GPTs are identified by three key features: their extensive impact on society, their potential for further technological development, and the 'innovational complementarities' that drive increasing returns to scale (Bresnahan & Trajtenberg, 1995). Productivity is a measurement of how much output is generated in relation to a fixed input, often expressed as output per hour of work. Perez (2002) provides a comprehensive framework for understanding this relationship, explaining how economic growth since the late 18th century has gone through five distinct stages, each characterized by a technological revolution. The most recent stage is marked by the integration of computer technology and ICT. In this stage the ability of smart machines to process and manipulate data and to rapidly advance digital technology

through network effects is paramount (Haskel & Westlake, 2017; Hendler & Golbeck, 2008). This has allowed for tasks that were once performed by humans to now be automated with the help of the technologies discussed previously.

2. Automation in Accounting and its effects on skill requirements

The rise of automation in finance, particularly in accounting, has brought about significant changes in the labor market, affecting the skillset required for accounting professionals (Autor, D. (2015). Automation in finance has led to both skill-biased technical change and routine-biased technical change requiring workers to adapt to new technologies while also automating routine and repetitive tasks. (Acemoglu & Restrepo, 2020; Autor, 2015).

Skill-biased technical change involves the development of new technologies that require higher levels of skill and knowledge, favoring highly-educated workers. Routine-biased technical change, on the other hand, involves the automation of routine and repetitive tasks, which can displace low-skilled workers (Acemoglu & Restrepo, 2020; Autor, 2015). The increasing use of automation in accounting is a prime example of this trend, with the potential to reshape the nature of accounting work. As automation takes over routine tasks such as data entry, accounting professionals will need to develop new skills in areas such as data analysis, IT, programming, and data visualization. However, technical skills alone may not be enough, as the rise of automation in accounting also highlights the need for non-technical skills such as communication, collaboration, and critical thinking (Brynjolfsson & Mitchell, 2017, p. 1533).

In this chapter, we will explore the different types of automation in accounting and the evolving skillset required for accounting professionals in the age of automation.

2.1 Automation in Accounting: Definition and Types

The automation of finance has been a long-standing process, dating back to the early 1900s with the advent of the tabulating machine (Edgerton, 2007). The use of such machines enabled the automatic sorting and recording of financial data, reducing the need for manual data entry and allowing for the automation of basic accounting functions (Fridenson, 2015).

The introduction of computers in the 1960s and 1970s further transformed financial automation. The development of mainframe computers allowed for the automation of back-office functions such as bookkeeping, accounting, and inventory management (Fridenson, 2015). Also, computerized systems allowed to automate routine tasks such as account reconciliation, transaction processing, and customer service (Heine, 2021). With the development of Local Area Networks (LANs) in the 1980s, the finance industry was able to streamline data processing, improving efficiency and accuracy (Kshetri, 2018). This automation resulted in a decrease in demand for manual data entry and other basic accounting functions. However, it also created a need for professionals who could understand and manage complex financial systems and the technology behind them.

The 1990s saw the development of algorithmic trading, which uses computer programs to execute trades based on predefined rules and parameters (Johnson, 2019). This allowed financial firms to execute large volumes of trades quickly and efficiently, without the need for human intervention. This decade was also crucial for financial automation, since the advent of enterprise resource planning (ERP) software introduced, which integrated all core business functions, such as finance, human resources, and supply chain management, into a single system (Bakken & Mahmood, 2014). This allowed for the automation of financial processes such as invoice processing and financial reporting. This also led to an increased demand for professionals who could integrate different computerized systems, ensuring that data was accurately processed and transactions were reconciled correctly.

The literature suggests that the evolution of automation in finance has had important implications for market efficiency, liquidity, and risk. Jarrow and Subramanian (2019) found that automation in finance has had significant effects on market efficiency, liquidity, and risk. High-frequency and algorithmic trading have improved market efficiency by enhancing price discovery and reducing bid-ask spreads. Additionally, automation has increased market liquidity by enabling faster trade execution. However, it has also introduced new risks like flash crashes and algorithmic trading malfunctions, requiring careful regulatory oversight.

The automation of accounting has continued to evolve in recent years, with the emergence of advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML), and Robotic

Process Automation (RPA). RPA solution uses software robots to automate repetitive, rule-based tasks such as data entry, reconciliation, and report generation. RPA involves automating repetitive, rule-based tasks using software bots. Many companies are using RPA to automate financial reporting processes such as balance sheet reconciliations and variance analysis, as well as compliance processes such as Know Your Customer and Anti-Money Laundering.

In recent years, the use of artificial intelligence (AI) and machine learning (ML) has expanded rapidly in the finance industry, enabling firms to analyze large volumes of data and make more accurate predictions. AI-based solutions use machine learning algorithms to perform more complex tasks such as fraud detection, predictive analytics, and risk management. Cognitive automation involves the use of artificial intelligence (AI) technologies to perform complex tasks that require decision-making, problem-solving, and critical thinking. (Kshetri & Voas, 2018). AI has the ability to process and analyze vast amounts of data, identify patterns, and make predictions based on that analysis. This technology has the potential to revolutionize accounting, as it can automate tasks that previously required human intervention, such as credit analysis, fraud detection, and risk assessment.

However, there are concerns around the role of AI in finance, particularly when it comes to decision-making processes. The use of AI algorithms to make decisions can be opaque, and it is important to ensure that these systems are transparent and fair. That is the reason why human supervision and control is still required. Despite these concerns, the potential benefits of cognitive automation and AI in finance are significant. With the ability to automate repetitive and time-consuming tasks, finance professionals can focus on more strategic and value-adding activities, improving overall efficiency and effectiveness. (Davenport & Ronanki, 2018).

ML, on the other hand, uses algorithms to learn from data and improve over time without being explicitly programmed. ML is also being used in risk management processes to identify potential risks and prevent financial losses.

There are several types of ML algorithms used in accounting, including supervised learning, unsupervised learning, and reinforcement learning (Bao et al., 2019). Supervised learning algorithms are used for tasks such as credit scoring, where the algorithm is trained on historical data to predict the likelihood of default or late payments based on various borrower characteristics

(Liu et al., 2019). Unsupervised learning algorithms, on the other hand, are used for tasks such as fraud detection, where the algorithm must identify anomalous patterns in data without prior knowledge of what constitutes fraud (Li et al., 2019). Reinforcement learning algorithms are used for tasks such as algorithmic trading, where the algorithm learns from experience how to maximize profits while minimizing risks (Lu et al., 2020).

Despite the benefits of ML in accounting, there are also potential risks and challenges associated with its use, including data privacy concerns, algorithmic bias, and the potential for over-reliance on automated decision-making (Choudhury et al., 2020).

2.2. Possible benefits and drawbacks of automation in accounting

Automation has some pros and cons which should be carefully examined within the organizations while the transition period in order to implement it in a proper and smooth way. It is especially crucial because this process should be accurate and efficient and also all the evaluations must be performed appropriately to manage the costs as well.

As far as advantages are concerned, reducing the tasks that are time-consuming will greatly contribute to companies' processes and therefore, personnel will instead focus on more value-adding tasks and this will in turn increase productivity (Gundumalla, 2021) For example, invoice processing can take a considerable amount of time and this can even delay the payments which can create an additional financial burden to companies. Repetitive and manual tasks become mundane and employees might not feel like they are a substantial asset to the organizations they work in, and their motivation could get weaker. Hence, engaging in more meaningful activities might also improve their enthusiasm and job commitment. This can also be favorable in terms of discovering the hidden talents that people within the organization have by giving them the opportunity to participate in different tasks which can broaden their horizons.

Automation has its benefits from the perspective of time and quality of work. For example, organizations with low level of automation struggle with control performances and different reports especially during the closing period and automating tasks will enable employees to identify and resolve errors in an easier and faster way (Moffitt, Rozario, & Vasarhelyi, 2018). It can be costly to implement robotification in business processes at first, but in the long run companies will

highly benefit from saving costs associated with errors or inappropriate utilization of labor force (Wilson & Sangster 1992).

Fernandez&Aman (2018) argue that automation will also be serviceable in terms tackling issues such as employee productivity and also labour force insufficiency. As is known, these days people are inclined to engage in more creative or value adding jobs and sometimes it becomes difficult for Human Resources Departments to fulfill the job vacancies which involve manual work. Lacity & Willcocks (2015) pointed out that firms will also enjoy having robots perform the tasks they need any time they want without taking into account working hours of employees. Using robots instead of humans will also give an opportunity to have accurate information and avoid it from being distorted that is going to add an additional contribution to firms.

Moreover, from the security point of view, Li&Zheng (2018) thought that when there are several employees working with different accounting tools they have access to companies' data which increases the chances of fraud cases but once those tasks are handed over to computers this can also reduce the possibility of financial fraud as well. Since financial fraud can negatively affect companies overall processes and reputation this will surely benefit organizations because when such cases happen it could also be costly for companies to carry out investigations and try to reach results.

Turning to disadvantages, it is crucial to assess them in order to prevent organization from additional costs such as inappropriate implementation of automation companies should clearly comprehend what challenges automation can create. Robots need clear instructions which are going to be taught by human labor so companies should make sure whether they have the right people for such a task. (Moffitt, Rozario, & Vasarhelyi 2018) To illustrate, in order to automate invoice processing process robots, need to know where the needed information is located so that they can enter the data in the system so in this case, as a first stage employees must somehow assist AI to learn it. This can creat an additional workload at the first stages of implementation.

Another point is that, if there are errors or inaccurate results generated by AI this can lead to further mistakes by misleading information which can result in financial loss and a lot of investigation (M. S. Manasa, 2022). Moreover, according to AICPA & CIMA(2020), security of the data can

also suffer, in case of cyberattacks companies might become at risk as they highly rely on digitalization.

Another potential drawback is costs associated with acquiring and purchasing the needed software or robots which can affect the revenue of organizations and it can also bring additional expenses for keeping robots up to date and maintained (Taha S., 2021). Small and medium-sized companies can sometimes simply not afford purchasing such systems and they either postpone transition to automation or they seek for financial support

Unlike Manasa (2022) that focuses mostly on Financial loss, Taha S. (2021) also focuses on the topic from the behavioral perspective, arguing that when automation becomes dominant in companies it is inevitable to have reduction in headcount for number of reasons, such as insufficient competence and basically the reduced need for additional staff and this can create tense and stressful environment in organizations as they can feel that they are at risk of losing the jobs at any time. Lowered team motivation and constant frustration will obviously have an adverse effect on overall quality of business processes and companies may suffer from it. In addition to this, Asatiani, A., & Penttinen, E. (2016) figured out that employees can take robots as their rivals, and this can affect their morale if the introduction and implementation of automation is not communicated appropriately. It is also important to make sure that employees are willing to accept to changes and they are not resistant to acquiring new skills, because it can be costly to look for new employees and it is generally not easy to find the right people to fulfill the new job roles created due to automation.

2.3 Changing skill requirements in Accounting

It is paramount to get an insight into how automation has affected job roles in accounting and how it altered the required skills from the workforce. Our objective is to categorize the skills necessary for Accounting and examine how the implementation of automation alters these requirements. Skills refer to a combination of abilities, knowledge, and expertise that enable individuals to perform tasks effectively.

In accounting, skills can be classified as technical and non-technical skills (Heine et al. 2021). The technical skills are related to the use of tools, machines, and software, and include digital

proficiency and technical expertise. (National Center for O*NET Development, 2021). Technical skills can also be categorized as non-cognitive or hard skills, which include digital proficiency and technical expertise. Non-technical skills, on the other hand, include cognitive abilities such as critical thinking, problem-solving, and decision-making, as well as soft skills such as communication, collaboration, and leadership (Heine et al., 2021) This typology of skills allows for a detailed examination of the changing nature of the profession. As Brynjolfsson & Mitchell (2017) mentioned in their studies, both technical and non-technical skills becoming increasingly important during the automation in accounting.

Moreover, this classification helps us to understand the impact of automation on technical and non-technical skills by examining the susceptibility of routine and non-routine tasks to automation. For example, a study by Autor and Price (2013) found that routine tasks, which require technical skills, are more susceptible to automation than non-routine tasks, which require non-technical skills.

Below Table 1 is provided which specifies the key technical and non-technical skills required and that can be required in the age of automation:

Table 1. Key technical and non-technical skills that are required in the age of automation

Technical skills	Non-Technical skills
Knowledge of accounting software such as QuickBooks, Excel, or other ERP systems (Gonzalez, L. R., 2018)	Communication skills (Jędrzejka, D. 2019)
Proficiency in data analysis tools and techniques (Swanson & Tyler, 2020)	Teamwork and collaboration skills (Vial,2019)
Understanding of automation tools and technologies such as machine learning and robot management (Alles & Vasarhelyi, 2017)	Problem-solving and creativity (Aghion, Jones, & Jones, 2017)
Knowledge of cybersecurity and data privacy laws (Fay & Negangard, 2020)	Adaptability and flexibility (Cedefop, 2018)
Familiarity with cloud-based accounting systems (Kwon & Lee, 2020)	Reasoning and decision making (Fernandez & Aman, 2018)
Risk analysis and management (Linsmeier & Thornton, 2020)	Emotional Intelligence (Goleman, Boyatzis, & McKee, 2013)
Business Decision Modeling (Lazar & Fuxman, 2019)	Negotiation and consultation skills (Manasa M., 2022)

First of all, it is noteworthy to point out that understanding of automation tools and technologies such as machine learning and robotic process automation should be examined which are likely to pave the way for employees in this changing era. Once business processes are automated there will be a significant drop in number of repetitive tasks which means that employees will have more time to work with data and perceive it correctly in order to derive some conclusions (Lui, G., Shum, C. 2022). At that point, making appropriate analysis is going to be crucial for accountants in order to facilitate the business processes and maintain the positions, so the technical skill such as data analysis and the ability to work with its tools is crucial.

Since companies are inclined to implement automation in their business processes as much as possible, it is no doubt that it could also create some opportunities for professionals to reshape

their careers and focus on the ways to automate different processes and tasks as well as how to accurately manage the process of shifting to automation. The new requirements that will exist in companies tend to be competent employees in automation who are highly aware of companies' business activities and their ultimate goals (Slavinskaitė, N., 2022).

Although it is apparent that computer skills have already been a requirement in accounting for a long time as companies turn to automation more and more, basic computer skills will no longer be sufficient but rather advanced computer programming skills will be demanded and companies will also need accounting personnel who can work with forecasting prospective economy tendencies (Chukwuani, D., Nnenna V., Egiyi D., Amaka M., 2020). Being able to forecast errors and issues will save accountants time if they can correctly work with large sets of data which will also be beneficial in terms of making right strategic decisions (Boomer, J., 2018). Accountants will also be expected to work with unstructured data which can provide significant insight to companies and organizations will also prefer to create a culture of continuous learning for making their personnel ready to unexpected and unpredictable changes (Manasa, M., 2022).

Kwon and Lee (2020) and Gonzales (2018) have identified that in the automation era of accounting, it is crucial for accountants to possess specific technical skills as well, such as familiarity with cloud-based accounting systems and knowledge of accounting software. Brazina, P.R. (2018) suggested that accounting professionals should take into consideration earning technology credentials which also include management of risk and information systems. Thus, they will secure themselves while advancing their careers and gain expertise in the areas that they need in order to combat changes happening in their job roles which will also increase and consolidate their credibility in their employers' eyes. Engaging firms in automation is expected to accelerate requirements for skills like performance management and decision support which means that in modern world accounting expertise in control, analysis and decision-making process will be more valued (Fernandez&Aman, 2018). It is also going to be a substantial benefit for accountants to have knowledge in using several software programs such as QuickBooks, Excel, or other ERP systems and accountants with technology-focused mindset will be preferred to others (Rauramo, P., 2021).

Furthermore, along with hard skills soft skills are also type of skills that prospective finance professionals should highly pay attention to. According to a study conducted by Vial (2019), successful digital transformation efforts rely heavily on collaboration as cross-functional teams that work together effectively are better equipped to create and implement new technologies and processes. In order to succeed in the challenging work environment, people will have to work on those skills so that they can improve their skills such as reasoning, problem-solving and decision-making, communication. Consultation skills is another aspect that accounting professionals may focus on, because although automation will contribute to make accounting processes more efficient, clients will still tend to trust personalized suggestions and feedback from experienced human labor. Manasa M. (2022) has figured out that companies in countries with high level of digitalization stimulate their employees to improve their soft skills and they also teach students STEM (Science, Technology, Engineering and Mathematics) at schools. Adaptability is another skill which is highly appreciated. According to a study conducted by the European Centre for the Development of Vocational Training, workers need to be adaptable and willing to learn new skills due to the rapid pace of technological change, with adaptability being identified as one of the key competencies needed for the future workforce (Cedefop, 2018).

Goleman, Boyatzis, and McKee (2013) conducted a study that investigated the significance of emotional intelligence at workplaces. According to the study, the ones who possess strong emotional intelligence are better equipped to manage teams and attain business objectives. This underscores the critical role of emotional intelligence in navigating the intricacies of contemporary workplaces. According to a study conducted by Sy, Tram, and O'Hara (2020), employees with emotional intelligence skills are more adaptable to changes resulting from automation and exhibit greater resilience when faced with job insecurity.

The advent of Artificial Intelligence which converts manual tasks to automated ones also creates new opportunities in terms of job openings so that new roles appear in Finance Sector. It is said that from the long-term perspective, there could be new jobs such as robot management and advanced data analytics (Asatiani, A., & Penttinen, E. 2016). If new vacancies are created this can also help to improve the skeptical attitude of people toward automation since they do not feel comfortable that their day-to-day tasks are going to be overtaken by robots. As far as people's attitudes are concerned, it has been found out that it can negatively affect their motivation and job

commitment and companies should carefully manage the transition to automation (Fernandez&Aman, 2018).

Automating mundane tasks will give a birth to new tasks for accountants such as making sure that robots work properly and they are up to date and they should be able to make necessary steps when robots fail to do some tasks so that they can detect, report and if necessary fix the errors posed by Artificial Intelligence (Kokina et al., 2021) Therefore, employees should be considering upgrading their existing skills in order to survive in a digital era and become a competent professional work companies' new requirement. A new term will be born, and companies will start to headhunt for robot accountants who act as robots' managers and control their work (Li Z., Zheng, L., 2018)

When it comes to organizations, they should be ready to invest in training their employees so that they can grasp the new skills in a smoother way because accounts will no longer focus on calculating financial figures or prepare reports and perform the control, they will act as a bridge between companies and clients to incorporate automation to their business processes (Shaffer, Gaumer & Bradley, 2020). The transition should be managed in a professional way so that all the parties remained motivated and committed as they used to. Therefore, companies could consider to hire some automation management professionals in order to deal with resistance to change, fear and frustration as well as assist employees in trainings.

Through comparing and contrasting the findings of various empirical research studies, several common themes emerge regarding the impact of technology on the accounting profession. One common thread is the importance of employee skill sets in effectively addressing the challenges and opportunities that automation poses. Gundumalla (2021) emphasizes the need for adaptability and flexibility in accounting professionals, while Lui and Shum (2022) highlight the importance of future-proofing skills through embracing new technologies. Ra and Unika Shrestha (2019) suggest that employees must foster learnability in order to adapt to technological disruptions.

Another common theme is the evolving nature of the accounting profession, with accountants' roles shifting from traditional bookkeeping and financial report preparation to consulting, business development, advisory services, and risk management (Greenman, 2017; Jędrzejka, 2019). These changes require accountants to develop skills such as communication, collaboration, emotional

intelligence, critical thinking, and complex problem-solving abilities that machines are less likely to possess.

The advent of technology has also transformed the way auditors approach their work, from a retrospective to a more forward-looking approach focused on forecasting and predicting the future (Pan and Seow, 2016). This transformation has enabled accountants to propose strategic solutions that improve end-to-end processes across various units and departments, rather than simply resolving issues related to back-end accounting processes.

Overall, the studies suggest that technology is disrupting the accounting profession and creating a need for specialized skills that are constantly evolving. To adapt to these changes, accounting professionals must embrace new technologies, foster learnability, and develop a range of skills that machines are less likely to possess. The findings of these studies have implications for the education and training of accounting professionals.

Data and methodology

This study employs a qualitative research design, as it aims to explore the perceptions and experiences of accounting professionals regarding the impact of automation on skill requirements. Qualitative research is an appropriate method for this study, as it allows for an in-depth exploration of the topic and the collection of rich and detailed data (Creswell, 2014). A comprehensive literature review was conducted to provide a theoretical foundation for the study. The literature review focused on the history of automation, current trends in automation, automation in accounting, the effects of automation on skill requirements, as well as the advantages and disadvantages of automation. The review of relevant literature provided a framework for analyzing the empirical data.

The primary data for this study was collected through open-ended interviews with accounting professionals who are actively involved in the automation of accounting processes. The interviews for this research study were conducted via video conferencing, and they were audio-recorded and transcribed for analysis. Each interview lasted approximately 30-40 minutes, providing ample time for in-depth discussion with the participants. The use of video conferencing allowed for greater flexibility and ease of scheduling for the participants, as well as a more natural conversation flow.

The audio recordings and transcripts were analyzed to identify patterns and themes in the responses, allowing for a comprehensive understanding of the specific skills that are in demand in the accounting job market as a result of automation.

The participants were selected based on their expertise and experience in the field of accounting and automation. The following table presents detailed information about the sample used in the empirical part of the research study. The sample includes nine accountants with 4-8 years of experience, an automation manager in the finance department, and an accounting team lead. The table below provides information about the gender, age, current job title, years of experience, and type of company for each participant.

Table 2. Sample Characteristics.

<i>Participant ID</i>	Gender	Age	Current Job Title	Years of Experience	Type of the Company
<i>A</i>	Female	26	Accountant	4	Accounting firm
<i>B</i>	Male	25	Accounting & Payments Specialist	4	Fintech
<i>C</i>	Female	27	General Accounting Specialist	5	Energy Company
<i>D</i>	Male	27	Accounts Payable Team Lead	4	Energy Company
<i>E</i>	Female	32	Accounting Expert	7	Energy Company
<i>F</i>	Male	34	Automation Manager	8	Manufacturing
<i>G</i>	Female	24	Accountant	4	Manufacturing
<i>H</i>	Female	32	Accountant	8	Manufacturing
<i>I</i>	Male	27	Accounts payable Specialist	5	Manufacturing

Note: Sample limits to accounting and automation professionals aged 25-32 with the 4-8 years experience.

The interview questions are formulated based on recent research and consist of six carefully crafted questions that were presented to the interviewees. The first question was asked in order to identify whether there is a sufficient level of automation within the accounting department of the organization and whether the interview outcome would contribute to the findings. We found that five interviewees considered their companies to be in the middle phase of automation, while four interviewees considered their companies to be quite advanced in automation. The following questions are the ones asked during the interviews.

1. Where do you see your company in terms of automation in the following timeline? Why do you consider so?



2. What routine and non-routine tasks have already been automated in accounting department of your company?
3. Can you share any specific examples of how automation has led to new job responsibilities or tasks in accounting that did not exist previously? (Narayanaswamy & Raghunandan, 2018)
4. Based on the tasks you have mentioned in the previous question what skills have become obsolete and what skills are in demand now after automation has been implemented? Please give us some examples. (Cokins, 2017)
5. Name some skills that accountants should obtain or enhance due to automation? (Chen, Zhang, & Huang, 2021)
6. Do you have any concerns or fears about the impact of automation on the future of the accounting profession? How do you think these concerns could be addressed? (Gilbertson, 2018)

The transcribed data from the interviews was analyzed using thematic analysis, which involves identifying and analyzing patterns or themes within the data (Braun & Clarke, 2006). The analysis focused on identifying the technical and non-technical skills required for accounting professionals in the era of automation, as well as the changes in skill requirements resulting from automation.

In order to reach conclusions frequency tables are devised by using the double classification method. Lu, Chen, and Li (2015) propose that by classifying data based on multiple criteria or attributes, researchers can gain a more comprehensive understanding of the phenomenon being studied.

The process of creating the frequency tables using the double classification method involved coding each response into the relevant category and then tabulating the responses for each category. This allowed for a comprehensive analysis of the data, which revealed insights into the specific skills that are most in demand in the accounting job market as a result of automation.

After analyzing the frequency tables, it was found that around 70% of the responses were identical across the participants. This high level of consistency in responses provided strong evidence for the skills that are most in demand in the accounting field in the age of automation. Guest, MacQueen, and Namey (2011) argue that frequency tables are a useful tool for quantifying the occurrence of different themes or categories in qualitative data analysis. Therefore, in this research frequency tables are used to visualize the skills that are in demand for Accounting professionals. Frequency tables are taken from three different perspectives, for companies with intermediate level of automation, companies with advanced level of automation and additionally, combination of both. Another visualization method that was applied is proportion categories. Miles and Huberman (1994) argue that proportion categories are useful for analyzing data from open-ended interviews because they provide a way to compare the frequency of different themes or codes that emerge from the data. In this paper, proportion tables are used to visualize routine and non-routine tasks that are automated in Accounting.

This study followed ethical guidelines for research involving human participants. The participants were informed about the purpose of the study, their right to withdraw at any time, and their right to confidentiality. All personal identifying information was removed from the transcribed data to ensure the anonymity of the participants.

One limitation of this study is the potential for selection bias, as the participants were selected based on their expertise and experience in accounting and automation. Additionally, the study focused on the perceptions and experiences of accounting professionals in a specific geographic location, which limits the generalizability of the findings.

Results

In this results section, findings of the research are present, which involved analyzing data from interviews with accounting professionals. Through our analysis, we aim to shed light on the implications of automation for the future of the accounting profession.

To comprehensively understand the impact of automation on skill requirements in accounting, it is crucial to examine the specific tasks that are being automated and the skills that are necessary to perform them. According to Mittal (2020), this examination can facilitate an analysis of how automation is affecting the accounting profession and the skills that are now crucial for professionals to remain competitive in the industry. Moreover, inquiring about which routine and non-routine tasks are being automated can help identify the tasks that are most susceptible to automation and those that require higher-level skills, which are less likely to be automated. This knowledge can offer valuable insights into how the nature of work in the accounting field is changing and can assist in developing recommendations for how accounting professionals can adapt to the new job requirements. The below figure illustrates the frequency of routine tasks that were mentioned by interviewees as being automated. The frequency of the answers is coded with numbers in brackets which can be seen in Figure 1.

Figure 1. The proportion categories for routine tasks

Reporting (6)	Data entry (4)	Reconciliation (3)	Statistics (3)
	Invoicing (5)		Payment Process (1)

Based on the responses given by different accountants, it can be seen that the top three automated routine tasks in the accounting department are data entry, reporting, and invoicing. The automation

of these tasks is typically achieved through the use of technology such as OCR and machine learning algorithms, which have significantly reduced the amount of time and effort required to complete them. Other tasks involve reconciliation, statistics and payment process.

The categories and their proportions for non-routine tasks that were automated are presented below.

Figure 2. The proportion categories for non-routine tasks

Prediction Analysis(Forecasting) (6)	Fraud detection (3)	Communi cation (1)	E- mailing (1)
		Access Data Self help tools (1)	Open Items Analysis (1)
		Data Extraction (1)	Month closing activities (1)

One-third of the responses claim that prediction analysis was automated, while one-fourth of the responses indicated that fraud detection was among the non-routine tasks that were automated. Other non-routine tasks that have been automated include communication, access data self-help tools, data extraction, e-mailing, open items analysis and month-closing activities. By automating these tasks, accounting professionals have been able to identify trends, forecast future performance, and develop strategies more efficiently and accurately.

It is interesting to note that many of the accountants mentioned that the implementation of automation in their accounting departments has allowed them to free up time for their team to focus on higher-level tasks that require a more human touch, such as analyzing financial data to provide insights and recommendations to business decision-makers. This suggests that automation is not replacing the need for skilled accounting professionals, but rather, is allowing them to focus on more complex and valuable tasks.

However, some non-routine tasks still require human intervention and validation, such as monthly closing accruals, and some tasks require a more ad hoc approach, such as asset price prediction

and fraud detection. It is clear that while automation has made significant strides in the accounting industry, there are still some tasks that require human input and cannot be fully automated. According to Person I (Appendix, p.49), "While automation can provide analytical data, it still needs a human being who can use that data to make informed decisions. Therefore, we need experts to interpret the data and apply it in a way that makes sense for the business "

After conducting interviews with different accountants, they revealed several examples of how automation has led to new job responsibilities or tasks in accounting. By understanding the new job responsibilities or tasks that have emerged as a result of automation, you can analyze the impact of automation on the skill requirements of accounting professionals and identify the skills that are now necessary to perform these new tasks.

One major area is data analysis, where accountants can now focus on analyzing large amounts of data to provide valuable insights to clients since automation has taken over routine tasks like data entry and reconciliation. This has also led to the creation of new roles such as Data Analyst, Financial Analyst, and Business Intelligence Analyst. With the increased use of technology in accounting, new roles such as IT Accountant, Technology Manager, and Systems Administrator have been created to manage and maintain these systems. However, automation has also introduced the potential for system errors, leading to additional workload for the team. As a result, the accounting team has to monitor the system periodically to ensure everything is running smoothly, which has also become a new responsibility. Additionally, the need for cooperation with new parties such as automation experts or specialists has arisen, requiring certain technical knowledge and collaboration skills to ensure successful automation implementation. Cybersecurity, process improvement, system maintenance and troubleshooting are other new job responsibilities and tasks that have arisen due to automation. Overall, these changes signify the evolving role of technology in accounting and highlight the need for accountants to embrace new challenges and opportunities.

It is evident that the implementation of automation in accounting has had a significant impact on the skill requirements in the industry. Several skills that were once considered essential have

become less relevant, while new skills have emerged as crucial for success in the field of accounting.

We have devised a frequency table to give an overall review to what technical and non-technical skills are in demand due to automation.

Table 3. Frequency table for technical and non-technical skills for all interviewed companies.

Technical Skills	f	%
Data Analytics	18	26
Expertise in cybersecurity	3	4
Vizualization	8	11
Knowledge in Accounting principles	1	2
Programming languages	1	2
Proficiency in technology (knowledge in software and tools)	13	18

Non-Technical skills	f	%
Critical thinking	6	9
Attention to detail	4	6
Communication	5	7
Decision making	3	5
Problem solving	5	7
Fast learning	2	3
	69	100

	Amount	%
Technical Skills	6	63
Non-Technical Skills	6	37

Note: In the table "f" represents the frequency of the word mentioned in the interviews and "%" indicates the percentage of that skill among all mentioned skills.

The dominance of technical skills such as data analytics and proficiency in technology is evident, while critical thinking and attention to detail are among the most in-demand non-technical skills. Cokins (2017) also suggested that automation can help accounting professionals shift their focus from transactional activities to analytical activities, which require a different set of skills.

According to the data collected, 26% of all respondents indicated that data analytics is the most required skill which was mentioned 18 times, while 18% of all responses suggested that proficiency in accounting software and tools is still essential, even in an era of automation and it was mentioned 13 times by interviewees. Additionally, 63% of the responses emphasized technical skills, while 37% highlighted non-technical skills.

After analyzing the responses to the first two interview questions, we categorized the participating companies into two groups based on tasks that they are already automating. We summarised these companies into 2 categories: (Company type A and Company type B): Company type A are the companies which automated basic accounting tasks such as data entry, reconciliation, invoicing, reporting, purchase orders; Company type B are the companies which along with the tasks mentioned in Company type A also automated fraud detection, forecasting, data analysis. These categories were established to gain a better understanding of the relationship between the automated tasks within the company and skill demand in that companies which is providing a more comprehensive and clear picture of the findings.

Below table shows the distribution of technical and non-technical skills among these two categories of companies.

Table 4. Frequency of Skills according to automation activities companies implement.

Activities that are automated

Company type A	Company type B
Data entry, reconciliation, invoicing, reporting, purchase orders	Along with the tasks mentioned in Company type A, Company type B also automates fraud detection, forecasting, data analysis.

Most demanded technical skills	Most demanded technical skills
Data Analytics (10)	Data Analytics (8)
Vizualization (3)	Expertise in sybersecurity (3)
Knowledge in Accounting Principles (1)	Vizualization (5)
Programing languages (1)	Proficiency in technology (5)
Proficiency in technology (8)	

Most demanded non-technical skills	Most demanded non- technical skills
Critical thinking (2)	Critical thinking (4)
Attention to details (2)	Attention to detail (2)
Communication (2)	Problem solving (4)
Decision Making (1)	Communication (3)
Problem Solving (1)	Decision Making (2)
Fast learning (2)	

Technical Skills	64%	Technical Skills	56%
Non-Technical Skills	36%	Non-Technical Skills	44%

Note: The numbers in brackets represent the number of times skills were mentioned.

The table presents the frequency of skills for each company type, where technical skills were represented in percentage (64% for Company type A and 56% for Company type B) and non-technical skills in percentage (36% for Company type A and 44 % for Company type B).

Firstly, it can be concluded that there is a higher demand for technical skills in Company type A, which mainly automated basic accounting tasks. Secondly, Company type B, which automated more complex tasks like fraud detection and forecasting, had a higher demand for expertise in cybersecurity and proficiency in technology. Moreover, both company types had a similar demand for non-technical skills such as critical thinking, attention to detail, communication, and problem-

solving. The demand for visualization skills was higher in Company type B, which could be attributed to the nature of the complex tasks that require more data visualization and analysis. This finding complements the work of Kahl, and Kovac's (2021) "The Future of work in professional services," where it was mentioned that automation will decrease the necessity for manual data entry and regular accounting duties, which will enable accountants to concentrate on more advanced responsibilities like financial analysis and strategy formulation.

The study showed that the automation generally in with the different automated task has a significant impact on the demand for technical and non-technical skills. The findings suggest that companies that automate complex tasks require more expertise in specialized technical skills such as cybersecurity and data analysis. The reason of need for cybersecurity was mentioned by Person A (Appendix, page 36) "To address concerns about reduced human expertise and increased fraud risks, it is important to ensure that automation is used in conjunction with human expertise and implement strong cybersecurity measures".

On the other hand, companies that automate basic accounting tasks have a higher demand for more general technical skills such as general knowledge in accounting and proficiency in technology and accounting software. Data Analytics is essential for both company types. Swanson and Tyler (2020) discuss the impact of data analytics on the accounting profession in their study and they propose that to thrive in the future, accountants must cultivate proficiency in data analytics and visualization. Technical skills like proficiency in Power BI, knowledge of programming languages like Python and VBA, and a strong understanding of data have become valuable assets for accountants.

The demand for non-technical skills was similar for both company types, indicating their importance in the workplace regardless of the extent of task automation. Chen et al. (2021) also stated that accountants in today's digital era will require extensive comprehension of technology, robust analytical capabilities, as well as exceptional teamwork and communication skills. Additionally, they must have the willingness and flexibility to consistently learn and upgrade their skills as technology advances.

The responses from the accountants interviewed show a range of attitudes toward the impact of automation on the accounting profession. Some see it as a positive development that can create new opportunities and increase efficiency, while others have concerns about job losses and the need for human expertise.

Most of accountants believe that automation can be beneficial if implemented correctly, in conjunction with human expertise and oversight, and with strong cybersecurity measures in place. They also mention the importance of reskilling and upskilling programs to support the workforce transition toward a more automated accounting environment.

There is a consensus that automation can help with basic and manual accounting tasks, allowing accountants to focus on more complex and analytical work. However, some express concerns about the competence of workers and the need for higher-level skills such as controlling and analyzing automation processes.

Some accountants express concern about job losses due to automation, but others believe that it can create new career opportunities that require higher-level skills. It is evident that human involvement in the workforce is decreasing, with robots taking on more responsibilities, and possessing both technical and soft skills is becoming increasingly important. Some experts express concerns about the need for workers to acquire higher-level skills to control and analyze automation processes. According to a survey by Sage, a software company, "over half of the accountants (57%) believe that their job roles will change significantly in the next five years as a result of automation and new technologies, and 32% believe that they will need to develop new skills to remain relevant" (Sage, 2019).

Overall, the accountants interviewed believe that automation is a reality that should be accepted and embraced, and professionals should learn more about software, and processes, and how to develop their skills beyond typical tasks. They emphasize that there will always be a need for analysis and consulting, where accounting professionals will be required to use their expertise, and taxes and other areas that cannot be automated will still require human input.

Conclusion

The main goal of this research was to identify what skills should be enhanced or obtained due to automation for accounting professionals. Automation influences many industries and jobs including Accounting and it is important to understand what changes occur in that sense.

In conclusion, the results of our empirical research suggest that the impact of automation on the accounting profession is multifaceted. While automation has significantly reduced the time and effort required to complete routine tasks, it has also introduced new responsibilities and job roles that require a different set of skills. The empirical data we collected through interviews with accounting professionals complements the findings of our literature review, which identified Data Analytics, Proficiency in Technology and Software, and Visualization tools as essential skills for accountants in the age of automation. Our empirical data showed that these skills were indeed highly demanded by employers in the accounting job market. In particular, Data Analytics was the most frequently mentioned technical skill, with all interviewees highlighting its importance. Employers highly valued Proficiency in Technology and Software, the ability to use visualization tools, which was also found to be important based on the literature review conducted in this research.

The implementation of automation in accounting has led to the emergence of new job roles such as Data Analyst, Financial Analyst, and Business Intelligence Analyst, while also creating the need for new technical roles such as IT Accountant, Technology Manager, and Systems Administrator. However, it has also introduced the potential for system errors, leading to an additional workload for the accounting team. Therefore, there is a need for accountants to develop new skills such as data analytics, proficiency in accounting software and tools, cybersecurity, and collaboration skills to ensure successful automation implementation.

The frequency table analysis highlights the dominance of technical skills such as data analytics and proficiency in technology, while critical thinking and attention to detail are among the most in-demand non-technical skills. While technical skills were more prevalent in both Company types, Company type A (which automated basic accounting tasks) had a higher demand for technical skills compared to non-technical skills.

The analysis reveals that data entry, reporting, and invoicing are among the top three automated routine tasks, while prediction analysis and fraud detection are the most common non-routine tasks that have been automated. Automation has allowed accounting professionals to focus on higher-level tasks such as analyzing financial data to provide insights and recommendations to business decision-makers. Nevertheless, some non-routine tasks still require human intervention and validation, and certain technical skills such as data analytics and proficiency in technology are among the most in-demand skills.

Last but not least, the importance of accounting-specific software programs and tools, as well as knowledge of accounting principles, were highlighted as significant Accounting specific skills. Overall, while automation has made significant strides in the accounting industry, it is clear that there are still some tasks that require human input and cannot be fully automated. Therefore, accounting professionals must be adaptable and continue to develop new skills to remain competitive in the industry.

The findings of this research have important implications for the education system, policy-makers, managers, and future research on automation. The education system needs to incorporate skills like data analytics, technology proficiency, and visualization tools into accounting programs to prepare graduates for the automated industry. When shaping policies and regulations, policymakers should take into account the impact of automation on the accounting profession. It is important for them to understand the evolving skill demands and make sure that appropriate training and development opportunities are accessible to accounting professionals. Managers should prioritize technical skills and create supportive environments. Future research can explore long-term effects, job displacement, and effective training strategies.

Appendix A. Interview responses.

Person A

1. I see the company I work in the beginning of the green part of the timeline, because this company is global international company one the purposes of which is to automate the processes and procedures of accounting in order to improve the efficiency and accuracy of the services provided to the customer list. So, the automation of the services as I mentioned before is the one of the main aims of the Company.

2. At our company, we have implemented automation for routine tasks such as data entry, reconciliation, and invoicing. We use technology like OCR and machine learning to automate these tasks, which has reduced the amount of time and effort needed to complete them.

For non-routine tasks like financial analysis, fraud detection, and financial reporting, we also use automation tools like data analysis software and machine learning algorithms. This has helped us to identify trends, forecast future performance, and develop strategies more efficiently and accurately. Implementing automation in our finance operations has greatly improved our productivity and accuracy, allowing us to focus on higher-level tasks and make better decisions for our company.

3. In our company, automation has created new job responsibilities and tasks in accounting. With automation taking over routine tasks like data entry and reconciliation, our accountants can focus on analyzing large amounts of data to provide valuable insights to our clients. This has led to the creation of new roles such as Data Analyst, Financial Analyst, and Business Intelligence Analyst. Additionally, with the increased use of technology in accounting, we have created new roles such as IT Accountant, Technology Manager, and Systems Administrator to manage and maintain these systems. To mitigate the increased risk of cyber threats as accounting systems become more digitized and interconnected, we have created new roles such as Cybersecurity Analyst, IT Risk Manager, and Information Security Officer. We believe that as automation continues to transform the industry, more new roles will emerge in the future.

4. In our company, the implementation of automation in accounting has led to the obsolescence of some skills and the increased demand for others. Skills such as data entry, basic bookkeeping, and manual data analysis are becoming less valuable. On the other hand, there is a growing demand for professionals with data analytics, technology, soft skills, and cybersecurity expertise. This shift in required skills reflects the increasing importance of automation and technology in the accounting industry.
5. In my opinion, the top three skills that accountants should obtain or enhance due to automation are data analysis skills, technology skills, and soft skills. With automation taking over many routine tasks, accountants need to have strong data analysis skills to provide valuable insights to clients. Additionally, with the increasing use of technology in the industry, accountants need to become familiar with various tools and software. Finally, accountants must develop strong soft skills, including communication, collaboration, and interpersonal skills, to work effectively with clients and team members.
6. I believe that in our company, we should be aware of the potential impact of automation on the accounting profession. It's true that some routine tasks can now be automated, which may lead to job losses for accountants. However, we can also create new roles and opportunities by shifting towards data analytics and other specialized skills. To address concerns about reduced human expertise and increased fraud risks, we should ensure that automation is used in conjunction with human expertise and implement strong cybersecurity measures. Overall, we can leverage the benefits of automation while taking steps to mitigate its potential downsides.

Person B

1. I think that our company is currently moving from the yellow zone to green. Our company has already implemented a lot of automation in our accounting department, which has been pretty exciting.
2. We've automated tasks like data entry, reconciliation, and reporting. We believe that by automating these routine tasks, we can focus more on the work that adds value to our business.

Currently we are preparing to automate non-routine, more complex tasks like predictive analytics and forecasting in the next few years. With the implementation of automation in

our accounting department, we've been able to free up time for our team to focus on tasks that require a more human touch, such as analyzing financial data to provide insights and recommendations to business decision-makers.

3. One example of how automation has led to new job responsibilities in our accounting department is through the use of machine learning algorithms to identify potential fraudulent transactions. While these algorithms are doing a lot of the heavy lifting, our team still needs to monitor and fine-tune them regularly. Another example is the use of automated data visualization tools, which has led to new tasks of creating more interactive and user-friendly dashboards for financial data.
4. With automation taking over the more routine tasks, skills like data entry and manual reconciliation are becoming less relevant. Instead, skills like data analysis, interpretation, and visualization are becoming increasingly important. For instance, instead of manual data entry, accountants now need to know how to use OCR (optical character recognition) technology and automated data extraction tools.
5. The top skills that accountants should obtain or enhance due to automation are data analysis, critical thinking, and technology proficiency. Instead of spending time on tasks like data entry, accountants need to be able to analyze data, interpret results, and provide insights to support decision-making. Critical thinking skills are also necessary to evaluate and interpret automated results, identify anomalies and exceptions, and to ensure data accuracy. Finally, technology proficiency is vital to ensure that accountants are familiar with the latest accounting software and automated tools.
6. While automation does present challenges for the accounting profession, I am optimistic that the benefits outweigh the concerns. To remain relevant, accountants need to embrace new technologies and develop new skills. Professional bodies and companies must invest in re-skilling and up-skilling programs to support the workforce transition towards a more automated accounting environment. It's important to note that errors and anomalies can still occur during the automated processes. Therefore, human expertise and oversight are still necessary to ensure accuracy and reliability.

Person C

1. I think my company is located in the middle of this timeline. The company where I work has been functioning for five years and I have been here for three years. I can see that clear automation has happened during these years and we are planning to automate financial schemes in the future.
2. .Our initial accounting goal is to create the necessary accounting reports (cash reports, stock reports), graphs, and visualizations so that our analytical leads can make the right decisions based on that. So, non-routine tasks that have been automated in our company include creating necessary documents based on our initial data and an automated reconciliation process. However, the initial data input from invoices is performed by people since there could be errors and it should be checked based on the agreements. Non-routine tasks that have been automated include the communication process between departments. Now, the information flow between departments is much smoother, and there is no need for additional communication and requests.
3. Automation has helped us decrease the workload of operational processes. So, if we had costs before, we could not analyze the reason for these additional interest invoices, additional costs due to a lack of time. Now, we have time to do these tasks, analyze the reason for our additional costs, which helps our organization to grow, understand the reason for the costs, and eliminate them in the future.
4. With the increasing automation of routine tasks in accounting, accountants now have more time to focus on analyzing data and making informed decisions based on the insights gained from the analysis. This means that the ability to use analytical skills to interpret data and draw meaningful conclusions is becoming increasingly important in the field of accounting. Before automation, all reports were created by people, but now, all this process is automated. However, the input of this data is still manual, which is why if there is some error in data input, it can affect all reports. Before, if there was any error, during the reporting process, a human could notice and eliminate it. But since it is all automated, we are trying to stay extra detail-oriented so that no errors could occur and affect all reports created. Also, all this automation happens in Excel, and skills require excellent Excel knowledge and knowledge of the formulas so that necessary data could be taken from

initial data that we input. So yes, technical Excel skills are crucial, and our company provides us with paid courses so that we would be qualified in this sphere.

5. I think most of the technical things in accounting could be automated, but not analysis. Accountants with strong analytical skills are better equipped to identify trends, spot anomalies, and develop insights that can help their organizations make strategic decisions. That is why analytical thinking skill, for me, is very important for a modern accountant. The second thing, based on analysis the accountant has made, is a decision-making skill. It is up to a competent employee, and this skill also cannot be obtained by machines. And the third skill is problem-solving. With the increasing complexity of business operations and the rapid pace of technological change, accountants need to be skilled problem-solvers who can identify issues, develop creative solutions, and implement them effectively.
6. While some people may fear the impact of automation on jobs, I believe that our concerns should be focused on the competence of workers, rather than the technology itself. In fact, automation can greatly improve the efficiency of many basic and manual accounting tasks, allowing accountants to focus on more complex and analytical work. With the rise of AI and machine learning algorithms, data analysis has become increasingly sophisticated, but there is still a need for human input and decision-making to ensure accurate results. Ultimately, it's up to us as accountants to use automation effectively and responsibly, and to develop the skills necessary to excel in this new era of technology.

Person D

1. I guess our company is in about 2/3 part of the green line. Our team is actively working on implementing automation on a daily basis, and we have a strong plan in place for the future. For instance, a couple of years ago, invoices were scanned and inputted manually, but now they are processed automatically. This is just one example of how we are leveraging automation in our processes.
2. For routine tasks, one example would be our Invoice Processing system. When a product is purchased from our company, a Purchase Order is generated automatically. The invoice is then sent through our scanning system partner, which matches it with the PO, and it's subsequently added to the payment system. However, not all invoices have POs, which means that many invoices still require human review. calculations. But now, all we have

to do is enter that information in the system, and the system will calculate the total and process the payment accordingly.

3. While automation has streamlined many of our processes, it has also introduced the potential for system errors. For instance, if an invoice is matched incorrectly or with the wrong beneficiary bank account, we may have to return the payment to the vendor and start the entire process over again. This can create additional workload for our team. Since our procurement side creates purchase orders manually, any mistakes in the invoice processing stage can have a cascading effect on the rest of the process until the invoice is paid incorrectly.
4. Although automation has simplified many processes, it's crucial to have oversight in our financial processes. Finance is a field where errors can be particularly costly. Attention to detail is critical now, especially in the automation era, and employees must understand the automation process to identify potential issues. What is less important is to knowing technical side of the processes that are already automated , for example invoice input or manual tax calculation.
5. I think the main skill that employees should obtain is to understanding risk sports of automation process. It requires the full understanding of the process. So they would be able to find errors in the system. The next one, which is actually connected is how to mitigate these risks , basically problem solving skills since automation can create sudden and new errors and mistakes and accountatnt should be able to elimnate them. Finally, analytical skills are essential for accountants to analyze the whole process and make data-driven decisions.
6. As a team lead, I have concerns that automation may eventually reduce the need for some of our employees. However, automation will also create new career opportunities that require higher-level skills such as controlling and analyzing automation processes. Overall, I believe automation is a positive development and the way of the future. However, it's important to implement automation correctly without any gaps, which can be a challenge for a large company like ours

Person E

1. I Think that our company currently is in the middle of this timeline. We are implemeting automation , but there still way to go.
2. I would say , that routine task might be change in our payment details. In these cases, we can simplify the payment process by using one payment file for transactions in a single currency. This eliminates the need to create or modify individual invoices separately. In addition, we have automated our invoice processing system to match invoices automatically. For non-routine tasks, we have implemented a special system for managing all requests received via email. This ensures that requests are directed to the appropriate team and reduces the likelihood of emails being sent to the wrong team or needing to be resent.
3. In my view, managing the automation process has become a new responsibility for our team. Although automating tasks has significantly reduced manual work, it is still important to monitor the system periodically to ensure everything is running smoothly. Therefore, our team needs to keep an eye on the automated processes to ensure they are functioning as intended.
4. While automation has eliminated the need for manual skills in accounting, precision and attention to detail remain critical skills for the profession. With automated systems, accountants must ensure that the data input into the system is accurate to avoid errors in financial statements. Additionally, proficiency in using accounting software and interpreting data from automated reports are now in demand skills.
5. Certainly, attention to detail and focus remain essential skills for accountants, especially in the era of automation. Logical thinking is also crucial, as it helps accountants to solve problems and analyze data accurately. In addition to these skills, a general understanding of accounting principles, including knowledge of software and data interpretation, has become increasingly important for the profession. In summary, the top three skills for accountants in today's automated environment are attention to detail, logical thinking, and a strong understanding of accounting principles and software.
6. Automation can lead to a decrease in the number of people needed to perform certain tasks. However, it is important to ensure that the system is set up properly and runs smoothly to

avoid errors. If the system is not functioning correctly, payment delays or errors can occur, which can damage the company's reputation over time. Therefore, it is crucial to implement automated systems carefully and monitor them regularly to ensure optimal performance.

Person. F

1. I would say. It's not the beginner. It is like intermediate because when I joined this organization some task were already automated. They started already and some processes are still going on. So it would be intermediate, neither beginner nor advanced.
2. In terms of routine tasks, I would say from the accounts payable and the receivable perspective, it's like invoice processing because major part of the invoice processing we are doing is a routine task. I think that's what we are focusing that we have to automate as much as we can to process automatically of invoices and non-routine task vendor open items analysis. So in that part., analysis should be done by humans. But The thing is, initial steps like preparation of this report and everything has been like kind of non-routine task and it has been already automated. As far as I know some closing activities and reporting have also been automated.
3. See automation. I would say robots are machines, so whatever programming you will feed in, robots and machine will exactly react like that. So something which is different or something new is that when reporting or other activities are not properly done by the robots in that situation person has to do the root cause analysis part. This is the part which definitely human has to do.
4. I would say that you know, if you were talking about something which is not needed anymore, like initially when I started my career to finance department, I always heard that, you know, if you are into accounts payable department, you just need to copy paste because you are doing the repetitive task. But now these are things done by the robots, because we have a lot of automation. The skills that are in demand I would say that analytical skills. So analysis part definitely is analytical thinking. I would say that every accountant or every person has not that much of interest into technical part. As far as technical skills are concerned then some software knowledge is also important. It's not only power BI, some other Microsoft Tools are also useful. For in example, in outlook there are so many opportunities to automate things, yeah.

5. I would say data analytics, critical thinking, little bit, you know, like IT skills which are most important that you have to have a little bit knowledge about the software, keep yourself updated, what's new in the market and how you can improve. So these are the things I feel like are very important from an accountant perspective. Last but not the least, data analytics is also important part.
6. As previously mentioned, robots are machines that react exactly as they are programmed. However, if they are given new inputs, there is a higher likelihood of errors occurring, placing an additional burden on the person responsible for managing them. Companies are increasingly focused on cost efficiency, leading to greater automation in the finance industry and resulting in fewer job opportunities. This trend concerns many, as it means that individuals with both technical and soft skills will be best suited for the industry. It is evident that human involvement in the workforce is decreasing, with robots taking on more responsibilities. To succeed in this industry, having both technical skills and soft skills is crucial. Otherwise, it may be challenging to survive, as the trend of increasing automation means that fewer human workers are needed. With more tasks being performed by robots, those who possess technical expertise alongside communication and interpersonal abilities will be better equipped to thrive in this changing landscape.

Person. G

1. I believe that the level of automation is situated between intermediate and advanced. There are significant efforts being made towards automation, which puts it in the green area of the spectrum. However, I think that it is still a work in progress and cannot be fully categorized as green. While there are numerous ongoing trials and processes aimed at automating tasks further, it takes time to develop and implement them. There is still much more to be done, and we are all striving to achieve it. Therefore, I would place it on the borderline between yellow and green, acknowledging that we have made progress but still have a ways to go.
2. Many routine tasks and general processes have already been automated, such as KPI reports, controls in working processes, and daily number tracking. Preprocessing of basic data, like invoice image recognition, has also been automated, and there are other tasks, like finalizing and posting invoices, that are automated as well. Many other processes are also automated, but some non-routine tasks, like monthly closing accruals, still require

human intervention to check and validate the automated results. However, even this non-routine task has seen significant automation efforts, with data extraction and filtering already automated in an initial phase.

3. It sounds like there are several new tasks and responsibilities that have emerged due to the focus on automation. Some examples include keeping an eye out for new candidates that can be easily automated, validating the accuracy of data extracted by ERP system, participating in automation projects, monitoring the performance of automation tools, and analyzing issues before communicating them to respective teams. Additionally, there may be a need for cooperation with new parties such as automation experts or specialists. These tasks require a certain level of technical knowledge and collaboration skills to ensure successful automation implementation.
4. There is very minimal need for basic data entry, as OCR software is used to detect information accurately. Invoice processing has also become much easier, with less need for manual input and more focus on validation and verification. So it's possible that skills related to manual data entry and document processing may have become less necessary with the advent of automation in accounting.
5. Analyzing processes and procedures is a critical skill in identifying automation opportunities and streamlining operations. Communication with both external and internal parties is also important to ensure that guidelines are respected and rules are followed. Additionally, flexibility in learning new software is becoming increasingly important in the accounting field.
6. I don't have any fears about the impacts of automation on accounting. It's widely accepted that many tasks in accounting will eventually be fully automated. However, I'm not fearful of this change because I see it as an opportunity to increase efficiency and cost-effectiveness. I don't believe the accounting profession will disappear or become useless, but rather that it will undergo some changes. There will always be a need for analysis and consulting, where accounting professionals will be required to use their expertise. While automation may lead to the disappearance of certain roles, such as bookkeeping and data entry, the profession as a whole is undergoing a makeover rather than disappearing completely. It's a reality that should be accepted and embraced. Professionals should learn more about software, processes, and how to develop their skills beyond typical tasks. It's

still important to have expertise in areas that cannot be automated, such as taxes. I believe there's still a lot of opportunity in the accounting profession.

Person. H

1. I would say that our company is somewhere in the middle when it comes to automation. While we have plenty of room for growth, the automation market has significantly evolved over the past few years thanks to various AI-related tools and technologies such as ChatGPT. At our company, we actively seek ways to incorporate modern technologies, especially those related to AI such as machine learning and neural networks, to automate highly manual tasks. However, one major challenge we face is data quality. As a large international company with over 5000 employees worldwide, we struggle with inconsistent data quality, such as random text or symbols that may not be related to date in invoices. Poor data quality can negatively impact AI algorithms. Additionally, data availability is not always guaranteed, and it often takes months for our automation team to coordinate with our IT teams to obtain necessary data. Therefore, we are still somewhere in between when it comes to automation implementation.
2. Our company has already automated many routine tasks such as reporting, which involves downloading Excel files from different ERP systems, using pivot tables, and consolidating data from various sources. We prefer using Power BI over traditional Excel as it is more efficient. Additionally, we have a golden rule in the automation team that we should avoid using XLS databases as they are complicated to work with. We also automate highly manual tasks like data entry, but only if they don't require analytical thinking, human checks, or have a long list of exceptions. These tasks fall under domain non-routine tasks, and we aim to automate them as much as possible.

Regarding non-routine tasks, we are developing a self-help tool that allows people to access needed data more quickly and easily. This tool is more ad hoc and not a routine task. We are also working on automating prediction tasks such as asset price prediction and fraud detection. Our asset price prediction tool works well and is developed in agreement with our internal customers. However, our fraud detection tool is still being tested as machine learning algorithms require extensive testing and data collection. These models cannot be left unmonitored and require regular fine-tuning and maintenance. Overall, we are making

progress in automating various tasks, but we must ensure data quality and availability before implementing any automation measures.

3. One example of a reporting task that demonstrates our responsibility is our new power governance model, which we are still working to implement. Going forward, we have agreed that our internal customers will be responsible for Power BI, which will require them to learn and understand how the system works. While the Automation team can support with data, they will not work on different design-related questions since they know their process works better when we collaborate. Together, we can prepare better Power BI dashboards that are more user-friendly and understandable for all. Another task that we must address is robot monitoring. Although the Automation team has the responsibility of fixing robot-related problems, they also manage several robots from different stakeholder sites. Hence, monitoring robots is the responsibility of the accounting department, who can work with the Automation team to create beautiful dashboards that display robot statistics. This allows them to manipulate data and understand how robots are performing. One interesting example is a dashboard that shows a competition between different robots, which is another issue that we must address. The Automation team needs to change people's mindset because sometimes individuals prefer manual tasks, even when a robot is better suited. These statistics can help us make the process more transparent, enabling the Automation team and individuals to see why robot performance is low. Perhaps it is due to a problem with the robot or the person responsible for monitoring it.
4. I will start by mentioning some skills that are becoming less important in today's job market. One example is data entry, which used to be a valuable skill. However, with the advancements in technology, this skill is becoming obsolete and will likely disappear soon. Another skill that is no longer as relevant is the mindset of staying with the same company for decades. Nowadays, it's essential for people to have the motivation and willingness to learn new skills. In contrast, skills that are becoming increasingly important include the ability and readiness to learn quickly. People who are fast learners have better opportunities for growth within the company. Another vital skill is proficiency in Power BI, as it is becoming more popular. Knowledge of popular programming languages like Python and VBA is also a valuable asset for accountants. This proficiency enables them to automate daily tasks. Lastly, accountants should have a strong understanding of data, including how

to gather and utilize data for different opportunities. This knowledge is particularly valuable in today's job market.

5. I can mention the same skills that I previously discussed, but I would like to elaborate on them. Firstly, having skills related to Power BI, such as an understanding of Power BI desktop, Power BI dashboards, and so on is essential. Secondly, basic knowledge about data quality and data maintenance is important because it plays a significant role in future processes. Automation cannot be done by a single developer; it requires cooperation with stakeholders, and if accountants provide specific information about the location of data or share examples of how they previously automated similar tasks, it can save resources. Thirdly, having a basic understanding of different programming languages can help accountants develop automations faster. Accountants can also offer ideas and feedback, which are always welcome. Finally, learning is a crucial skill in a fast-changing world. Individuals who are motivated to learn and be flexible will be excellent accountants, and they can rest assured that their workplace will still be available in the future, albeit possibly in a different company.
6. Concerns or fears about the impact of automation are very realistic. Our automation team has the target of making the lives of our accountants easier and more comfortable with automation. It's the team's task to advertise automation as a friend rather than an enemy, as it can help make working life more interesting. Our accountants are intelligent and highly educated people with amazing experience. However, their tasks usually involve downloading different Excel files and gathering them into one file. What's the point of this task if it can be automated today and they don't use their potential? These tasks don't help them grow professionally, and unfortunately, some companies use automation only for cost savings. The biggest indicator of successful automation for most companies is FTE savings or full-time employee savings, which means how many people can be fired after successfully implementing automation. Our automation team doesn't support this kind of approach. Automation should help exclude highly manual and boring tasks, and our accounting team should support our robots. This is a natural growth process where we automate highly manual tasks first, and then our accountants can help us create even better automation or even create their own automation. There are many software and companies offering low-code or no-code automation, and people don't need specific programming

language knowledge for this. In the future, accounting might be more about a person who can easily use Power BI and find the necessary data without contacting the automation team. This person should be able to create their automation for their own tasks, and this is a good challenge for all accountants in all organizations.

Person. I

1. The timeline for the adoption of automation technology varies by industry and use case. Manufacturing and logistics have been using automation for decades, while healthcare and finance have been slower to adopt due to concerns about data privacy and complexity. However, the trend towards automation is increasing across all industries, driven by the need for cost reduction, efficiency, and improved customer experience. Organizations that invest in automation technologies like AI, machine learning, and RPA can free up employees to focus on more complex tasks, thereby gaining a competitive advantage. Our company is also part of this progress, and we have a clear mission and vision for digitalization of all accounting software. I estimate that we have already achieved around 70% progress in our digitalization efforts, and we will continue to move forward
2. Automation has enabled accounting departments to automate routine tasks such as transactional consultation and report generation. Non-routine tasks that may be automated include fraud detection, risk analysis, and forecasting. However, the specific context in which these tasks are automated depends on the company. At our company, we take both routine and non-routine tasks seriously. Data entry and reconciliation are examples of routine tasks that are mostly automated, with software automatically collecting and processing the necessary steps. For invoice processing, we also have software that scans and processes almost 90% of the task automatically, although some parts may still need human intervention. When it comes to non-routine tasks, analysis and forecasting require an expert in the field. While automation can provide analytical data, it still needs a human being who can use that data to make informed decisions. Therefore, we need experts to interpret the data and apply it in a way that makes sense for the business.
3. The introduction of automation in accounting has brought about new job responsibilities and tasks, such as data analysis, system maintenance and troubleshooting, cybersecurity, and process improvement. These tasks require accounting professionals to have additional

skills and knowledge to manage them effectively. These changes signify the evolving role of technology in accounting, and highlight the need for accountants to embrace new challenges and opportunities. For example, in the accounts payable department, advanced tools and technology are already in place to process invoices without human intervention. However, it is still necessary to monitor the software and tools to ensure that they are performing as intended. Even in 50 years, we will still need to control and manage robots and other automated systems. Therefore, it is crucial for accountants to be skilled and adaptable to these automated software tools. It's worth noting that these software tools are created by humans, and even if some are also created by other software, control remains in the hands of the people who created them. As accounting professionals, we need to adjust and become proficient in using these automated tools.

4. In general, some skills have become less in demand in the market due to automation, such as time tree reconciliation and report generation, which are mostly done by robots. On the other hand, there are also skills that are highly in demand, such as data analysis, technology proficiency, communication skills, and critical thinking. With the increase in financial data available, the ability to analyze and interpret data has become a highly valued skill. It is important to make data visualizations to easily understand the data, and software can help create these visualizations. Therefore, experience and skills in data analysis and visualization are in high demand. At the same time, there is also a demand for language and communication skills to create and explain the data quickly and effectively.
5. First of all, as I mentioned earlier, data analysis is a top priority skill for accounting professionals. Additionally, communication skills and critical thinking are also crucial in-demand skills in the current job market. If accountants wish to secure their positions in the next five to ten years, they must adapt to these skills and be competitive in the market to either land a good job or improve their current job.
6. I don't have any concerns or fears about automation because it's been an ongoing process for decades and people are still performing well. However, there are certain things we need to understand and follow. One concern is that automation could displace accounting professionals who perform routine tasks that can be automated. Another concern is that too much reliance on automated systems could lead to a decline in the quality of financial reporting. To address these concerns, it's important to recognize that automation is not a

replacement for human expertise in accounting. Instead, it's a tool that can help accounting professionals do their jobs more efficiently and effectively. Accounting professionals should adapt to the changes brought about by automation and develop the skills needed to manage new responsibilities that arise. Additionally, organizations should invest in training and development programs to help employees adapt to the changing landscape of accounting. It's also important to consider the ethical implications of automation in accounting, such as concerns around the accuracy, reliability, and potential bias of automated systems. Organizations should take steps to ensure that automated systems are subject to appropriate oversight and validation. In summary, while there may be concerns about the impact of automation on the accounting profession, these concerns can be addressed through education, training, and ethical considerations.

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Resümee

Nõutavad oskused raamatupidamisspetsialistidele automatiseerimise ajastul

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Automatiseerimise kiire arengu tõttu on kasvanud ka vajadus mõistmaks selle mõju tööjõule ja erinevate ametite jaoks vajaminevatele oskustele. Käesoleva lõputöö eesmärk on uurida raamatupidamises nõutavaid oskusi automatiseerimise ajastul, keskendudes nii tehnilistele kui ka vähem tehnilistele oskustele. Uurimismeetod hõlmas intervjuude läbiviimist raamatupidamisspetsialistidega, et koguda kogemustel põhinevaid andmeid. Kuigi automatiseerimine on täiustanud paljusid tehnilisi ülesandeid, on see suurendanud ka nõudlust muude oskuste järele, nagu probleemide lahendamine, kriitiline mõtlemine ja suhtlemine. Lisaks rõhutatakse uuringus raamatupidamisspetsialistide kohanemisvõimet ja uute oskuste omandamise olulisust, et olla kursis tööstuse tehnoloogiliste edusammudega. Antud uurimus annab panuse kirjandusele, mis käsitleb automatiseerimise mõju oskusele, keskendudes eelkõige raamatupidamise erialale. Selles rõhutatakse automatiseerimise mõju mõistmise olulisust nii tehnilistele kui ka vähem tehnilistele oskustele ning spetsialistide võimele kohaneda tööstuse muutuvate nõudmistega. Käesoleva uuringu tulemused avaldavad mõju raamatupidamisalasele haridusele ja koolitusele, samuti poliitiliste otsuste kujundajatele ja organisatsioonidele, kes püüavad kiire tehnoloogilise arengu ajastul konkurentsivõimelisena püsida.

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