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The Role of Artificial Intelligence in Transforming Accounting Efficiency and Effectiveness

Kay Loenen | s1023722

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Supervisor: Roeland Aernoudts

Radboud Universiteit

Abstract

In today's society, technology is more important than ever, which can be seen on the job markets as well. Artificial intelligence is a technology that is used in different sectors. Within the accounting sector, firms are experimenting with AI, but it is not yet used to take over certain tasks. How can artificial intelligence influence the current accounting activities and how do accountants think about the developments? This paper examines the impact of AI on the efficiency and effectiveness of the current accounting activities. To determine this, a survey was distributed among accountants. The survey was completed by 127 respondents, and the results of this survey were combined with findings from previous research to determine the effect of AI on accounting activities. The findings of this research showed that the use of AI has a positive impact on the accounting efficiency and effectiveness. In this study, the difference in attitude towards the development of AI between different ages and genders were compared as well. The study showed that the different age groups had a similar idea about the developments and use of AI. The male respondents showed a more positive attitude towards the development of AI, compared to the females.

Inhoud

1. Introduction

Probably everybody has seen an image, video or even a song or speech that has been created by a program such as ChatGPT and sometimes people do not even know whether it was made by a human or not. ChatGPT is an artificial intelligence (AI) language model which provides humanlike responses and dialogues to questions or assignments you give it (Hetler, 2023). Artificial Intelligence is a technology that enables computers to simulate human intelligence and problem-solving capabilities. These computers and machines can perform tasks that normally would need human intervention (IBM, sd). The development of AI creates opportunities for AI to be used in various different ways. Students from the Erasmus University said in a survey that 92% of the 158 respondents regularly uses ChatGPT (Smalling, 2023). Giant tech companies such as Google, Amazon, Apple, or Facebook are investing millions to create AI-based applications and services (Kruse, Wunderlich, & Beck, 2019). These tech companies show it can be useful to improve the online experience for their customers. AI is becoming a standard usage in several companies and practices. That is why the expectation is that the development of artificial intelligence influences our daily jobs and practices.

For various types of companies AI is becoming more interesting, because of the development of artificial intelligence and the different types of functions it can perform. Firms started to look into using AI within their business process and created a strategic plan where the artificial intelligence would benefit their processes. The artificial intelligence may possibly support firms in various areas. When AI is used strategically it can help in the decision-making process, but on the other hand it can help to improve stakeholder relationship (Borges, Laurindo, Spínola, Gonçalves, & Mattos, 2021). For companies there are different areas where the correct usage of AI can become beneficial. With all these opportunities and possibilities, new challenges and problems arise. Artificial intelligence is still relatively new to various businesses, and it is still further developed and improved upon. That is why firms may think twice about implementing artificial intelligence into their business processes. When a firm decides to implement AI into their business processes, the firm must know the potential managerial challenges as well as implications in their organization or their workplace. The management must take privacy risks into account that arise, while within the organization people need to be educated to adapt to the new technology (Benbya, Davenport, & Pachidi, 2020). This shows the usage of AI within firms can help within their practices and management, but research and strategic planning needs to be done to make it work. Within different types of businesses, the usage of artificial intelligence can change their business processes and create a technological development within their industries.

These developments of artificial intelligence have had effects on different types of industries, which causes a fear to within the employees of certain firms. The development of artificial intelligence can create opportunities for firms to achieve the goals they set. Within the current digital economy, the AI driven robots can be useful for certain firms, but this depends on what type of industry these firms are operating in. For example, a company that creates different types of products in a factory can choose for an AI programmed robot, which can work for cheaper and for longer hours than humans can (McClure, 2018). This can cause a lot of fear for people who are working in factories where their tasks might be replaced by a robot in the future. The question is whether the development of AI influences certain jobs, or in other words, will human performed tasks be replaced by AI. One perception is that AI will assist people in their jobs to become more productive instead of replacing them in these jobs. These new technologies are referred to as intelligence-assisting innovation (IA) (Korinek & Stiglitz, 2017). There is a difference in the perception of people regarding the development of artificial intelligence. Some think it can become a helpful colleague that can assist humans in certain tasks, while others are fearful about losing their job. This of course also depends on the type of job and what tasks and practices are included in this job.

An accountant has different responsibilities within their daily practices, compared to the practices of a factory worker for example. Most of the activities done by accountants involves data and converting this information data into reliable and useful financial reports (Dehghanzade, Moradi, & Raghibi, 2011). Accounting practices also involve working with money from their clients, where the accountants need to be ethical and responsible. That is why ethical and moral issues are an important aspect in the current accounting study programs and should continue to be (Koumbiadis & Okpara, 2008). Accounting practices involve a lot of data converting, which can be repetitive, but there is still a need of responsibility and ethical behaviour. With the introduction of AI, the limits of human creation and interaction are challenged (Mohammad, et al., 2020). For accountants, the question remains in what way AI will affect their accounting practices and whether AI may even take over their jobs.

1.2 Research Question

The goal of this research is to show how the development of artificial intelligence can possibly influence accounting practices. This to contribute to the knowledge for accounting firms to determine whether to use AI and to show accountants what impact AI may have on their jobs. To gain this knowledge, this research answers the following research question:

What effect can the development of artificial intelligence have on the efficiency and effectiveness of accountants their jobs?

This study will furthermore examine whether these changes are also affecting the education programs of the different postmaster programs for the chartered public accountant (CPA) in the Netherlands.

1.3 Relevance

The development of artificial intelligence is expected to influence various jobs and industries. In certain industries the AI driven robots and programs are taking over people their jobs, while in other industries employees work together with AI as a digital colleague. Some firms see it as an opportunity because there are certain aspects of AI that make it attractive for accounting companies to use AI (Varzaru, 2022). Companies see it as an opportunity, while some accountants are afraid of losing their job. According to a study from Oxford University in 2015, accountants have a 95% chance of losing their jobs as machines take over (Griffin, 2019). It is therefore important to determine what accountants can expect in terms of changes in accounting practices.

This research can be useful in a number of ways. Those accountants who may be afraid of their current jobs can gain knowledge about how the accounting practices are expected to change. Accounting firms are committed to help their clients in the best way possible, but they also want to do it in the quickest and cheapest way possible. For accounting firms, there are several advantages and opportunities when implementing AI within their accounting systems. On the contrary, there exist numerous implications and challenges that might arise when using AI. The limitations currently known can be seen as potential future research, such as the adaptation of AI in small and medium-sized enterprises (Lemos, Ferreira, Zopounidis, Galariotis, & Ferreira, 2022). This is just an example of studies showing the possibility and need of future research on using AI in accounting systems.

When firms decide to implement artificial intelligence within their accounting systems, many of the employees may not have the knowledge and skills needed for these programs. There are several advantages to using artificial intelligence in your accounting practices, but employees may need to be educated on the usage of AI. Due to the emergence of artificial intelligence and the potential application in accounting, questions regarding the accounting education are being asked. How can accounting education incorporate the necessary adaptions to train students in using AI, but also about being aware of things like human value when using AI (Losbichler & Lehner, 2021). This indicates that there are questions regarding whether the current education of accountant students is focused on the correct aspects or if changes are needed. According to research from Akinadewo (2021), there is a need to develop and improve accountants their knowledge regarding AI technologies and systems. This paper can help to show CPA educations where they need to develop and improve accountants their knowledge.

2. Research Method and Outline

2.1 Research Method

In order to answer the research question, it is important to create a well-designed research. When conducting this research, there needs to be a research method that aligns well with the objective of this research. The research presented in this paper is based on a survey research method combined with a literature review. This helps to provide an answer as to what effect artificial intelligence can have on accountants their jobs and how this might help in schooling new CPAs. In this survey, respondents are asked multiple questions about the use of artificial intelligence within their company and what they think of AI.

The literature review provides a foundation for the research and survey to show the impact of AI on accounting activities. Using the knowledge gained from previous research, it is possible to determine what the results of the survey possibly say about the influence of AI in accounting. The survey is created to show how artificial intelligence influences the current accounting activities. The focus of the survey is asking employees of accounting firms about their experience with AI and what they expect about the impact of AI on their jobs.

Furthermore, questions about the current usage of AI in their accounting firm and practices are asked. Part of the survey focuses on the extent to which their firm currently uses AI for accounting practices. In the other part of the survey, the respondents are asked about their opinions on the developments of AI in the accounting sector. This reveals whether the accountants have any experience with using AI for work and how they feel about the developments. Are the accountants fearing for their jobs or do they feel safe and think AI can become a helpful digital colleague? The survey helps us understand what accountants believe the impact of AI on their jobs can be and how they may have already experienced it.

To create the survey, Qualtrics surveys is used. Qualtrics is a web-based software to create surveys and generate reports. This survey will be distributed to different accounting firms and this way answered by people working for different companies. In the beginning of the survey the respondents get be answered general questions, like their age, gender, and their function. The survey is anonymous to make sure people answer as truthfully as possible. Other information like age or function can possibly show certain trends between for example an employee of 50 years old or an employee of 25 years old. Maybe the younger people are more experienced with AI and see the possibilities of the development while older people might have less knowledge about artificial intelligence. This helps to show what effect the development has on accounting and how this differentiates between different people.

2.2 Thesis Outline

This research papers contains multiple chapters, and these chapters are divided into different subchapters. The first chapter provides an introduction to the subject, as well as an idea of the problem this paper is aimed at. In the first chapter, the research question and the relevance of this research are introduced as well. The second chapter is used to show the research method and the outline of the thesis. The next chapter is a literature review on which this research is based. The literature review discusses the opportunities and challenges of implementing AI in accounting, as well as how the efficiency and effectiveness of accounting activities can be affected. The knowledge from the literature review is used as a base for this research and to create the hypothesis. In chapter 4 the methodology of this research is described. The focus here is on the design of the survey and the tests. In chapter 5 the results of this research are described. From these results, the conclusion, interpretation, implications, and limitations of the findings are given in chapter 6. Suggestions regarding potential future research are discussed in chapter 6 as well. With an overview of the literature used within this paper in the bibliography and an overview of the survey questions in chapters 7 and 8.

3. Literature review

The research needs to be based on existing literature and the data from these studies. In the literature review, the existing literature is reviewed to determine what important aspects need to be considered and to show what this research is based on.

3.1 Efficiency and Effectiveness

Accounting firms strive to be as efficient and effective as possible, but how do they achieve this? The accounting effectiveness is about creating accounting information and advice that is useful for the different users in their decision-making process. Accounting information needs to give a faithful representation of the company and the data needs to be relevant for the users (Tontiset, 2022). This information needs to be free of errors and according to the standards to make sure it is truthful and relevant. When accounting information provides a truthful and complete representation and can help users in their decision-making process, the information is useful and relevant. With the resources available to the accountants, they aim to achieve the goal of providing this useful and relevant information.

Effectiveness is important for accounting firms, but accounting efficiency is important as well. Accounting firms care about the quality of financial statements, but they want to achieve it in the cheapest way possible. Efficiency is about performing certain tasks in a timely and cost-effective way by using standardised processes (PwC, 2012). Accounting efficiency is about creating financial statements and advice in the cheapest way possible. It is cheaper when accountants prepare these statements and advice using the least amount of time and resources possible. For example, an accountant uses less time for a client than the previous year. Using less time means the accountant has more time for other tasks, which helps the accounting firm, and the client is happy because they will have to pay less money.

3.2 Quality of Financial Statements and Advice

Accounting efficiency and effectiveness are important for accounting firms, but how do the accountants contribute to this. It is important to understand the accounting activities that influence those factors, to determine what influence the accountants have on this.

3.2.1 Financial Statements

According to research from Tout et al. (2014) and Iatridis (2010), accountants play an important role in the decision-making process of their clients. This role is about preparing financial reports and statements that can be used for the decision-making process. This sounds standard for accountants, but it is about the quality of these financial statements. The quality of financial statements is based on how useful and reliable the information is for the users. High quality reporting statements need to be free of errors and meet the reporting standards. Financial statements that contain several errors can give a false representation of companies' financial situation. False representations can give users the wrong ideas when making their decisions. Accountants need to detect errors as much as possible and make sure users receive truthful and relevant information. This improves the quality of the statements, which indicates how useful the statements are in the decision-making process. All Humans make mistakes, which can make it challenging to always produce high quality financial statements.

During the creation of the financial statements, human errors may occur, but human biases may as well. Souza, Niyama, and Silva (2020) conducted research on the potential human biases that may arise during the preparation of financial statements. Humans have it in their nature to sometimes make unconscious or unintentional decisions. These decisions can impact certain accounting activities when it happens. An example of a bias is when accountants already have an opinion about a client without having any data or contact. There are several types of biases, and it is difficult to detect those biases in the accounting activities. Financial statements are used by various users who use them for different purposes. These statements need to be of high quality and free of errors for the users. According to Souza, Niyama, and Silva (2020) there are several types of biases that can possibly affect the quality of these statements, such as the familiarity bias. Preparers of the statements might be familiar with the task or client and think less cautiously. Newer preparers are more cautious and want to make sure everything is according to the standards.

The accountant, as a professional, has the responsibility to protect investors by making sure they receive adequate accounting information (Biagioni, 1975). The quality of financial statements is about sharing the right and useful information to the people who use it, like investors or businesses.

3.2.2 Financial Advice

Financial reporting is an important accounting task, but the accountants have an advisory role as well. Research from Kamyabi and Devi (2011) showed how important an external accountant can be in giving advice to a company. From their research they found a positive effect between the performance of Small and Medium-sized Enterprises (SME) and the use of advisory services. This shows how important the advisory role of an accountant can be. Financial advice is about helping companies make a decision and getting the most out of the company. If a company is unsure about a certain investment, financial advice can help them by showing how the investment could impact their current business process. There is a positive relationship between managers with more accounting knowledge and the usage of advisory services. Managers with more knowledge of accounting know how important these services can be in improving the performance of their company.

Research from Stone (2015) showed different aspects of the advisory role as an accountant. Accountants were asked about their perception of advising clients and the results were interesting. There can be a big difference in clients and how the accountants communicate with each client. It is not just about helping the clients, but also about the possible frustration, conflict, and confrontational behaviour from clients. Accountants need to think about the best way to advise certain clients and how to get the most out of the company. This can sometimes take a considerable amount of time, especially for large or complicated clients.

3.3 Opportunities of AI in accounting

Accounting activities are about helping clients and creating truthful and useful information. Artificial intelligence can possibly help accountants in these activities, but what opportunities arise for accounting firms when using AI?

3.3.1 Human Errors

As artificial intelligence continues to develop, it can create different opportunities and advantages in multiple industries and jobs. How can artificial intelligence affect accounting practices? According to the studies from Yi et al. (2023) and Kommunuri (2022), certain classical accounting challenges can be addressed by using artificial intelligence. Both studies were focused on the application of AI in accounting and the multiple possibilities arising from the use of AI. Accounting relies heavily on data, and converting this data requires a lot of manual input, which can be time-consuming and laborious. An example of the use of artificial intelligence is a program that automates the data acquisition, which reduces the human errors and the time needed to acquire the data. AI reduces the time required for these tasks and improves the quality of the data by reducing human errors. Kommunuri (2022) stated: “In that sense, AI’s computational power does not displace human performance, but rather complements it.” When AI is used to acquire data, it can help accountants perform their tasks instead of replacing them. This is one of the classical accounting challenges that can be solved by utilizing artificial intelligence, but AI can help accountants in multiple different areas.

3.3.2 Human Biases

Artificial intelligence can help accountants in converting data and reducing the human errors, but it can help by reducing human biases as well. Mohammad et al. (2020) described that humans sometimes do not follow all the specific rules and regulations perfectly. Errors can happen because it was just a mistake, but they can also happen when the accountant is biased. The bias can overshadow the professionality of the accountants and makes them forget about the requirements of their jobs. AI is never biased and does not make decisions without taking into consideration certain important information. Mohammad et al. (2020) stated: “When combined with the speed, accuracy, and absence of biases the computer program will prove much more effective.” Artificial intelligence can help accountants convert their data in several ways and provide a higher quality outcome.

3.3.3 Fraud Risk and Risk Management

The data must be used responsibly and can be used for different AI applications to improve productivity. Since the COVID-19 crisis and firms operating in the 'new normal', there has been an increase in fraud risk (Deloitte, 2021). There are multiple factors that may increase the fraud risk, one of which is the 'new normal' work environment. This work environment can raise concerns about fraud in multiple areas of a firm. For example, whether the control and oversight over employees and operations is still sufficient. This shows the need for good fraud detection methods. Research from Moudud-Ul-Huq (2014) mentioned the higher quality of fraud detection when AI is used. Humans can make mistakes and sometimes miss fraudulent statements or transactions, but AI can decrease the human mistakes and help detect fraud. Moudud-Ul-Huq (2014) and Tircovnicu and Hategan (2023), conducted research aimed at the possible improvement of risk management and fraud detection when utilizing AI for accounting practices. The risk analysis of investments was one of the examples that showed how AI can be useful. With the usage of artificial intelligence, the accountants can make more accurate risk assessments and instruct their clients about investments.

3.3.4 Impact on Efficiency

Accountants are faced with certain tedious tasks that can be time consuming. Many of these tasks have to do with converting or analysing data to make financial statements or advice. Artificial intelligence can be used to do certain tedious tasks quicker and this reduces the costs and increases the time that can be used for other tasks (Hashem & Alqatamin, 2021). When AI gets implemented to do certain tasks, the accountants get more time to focus on other tasks. The accountants do not have to focus on converting the data anymore and can use this time to prepare financial statements or advice. By using this time to prepare financial advice for clients, the accountant can help more clients using the same amount of time as before. The accountants want to use the least amount of time possible to create the same amount of output, by for example using a new system. Artificial intelligence can be this new system and it can have a positive effect on accounting efficiency.

3.4 Challenges from AI in accounting

When a new technology or system gets implemented within a firm, it creates opportunities as well as challenges. What challenges could arise when accounting firms decide to implement AI in their current activities?

3.4.1 TOE Framework

The implementation of new technological systems or programs within an accounting system creates challenges that were not of importance to the management before. In previous research, the focus was on the challenges and implications arising from using AI in different aspects of the accounting practices. Kruse, Wunderlich and Beck (2019) used the TOE framework to determine and show what challenges the management and accountants have to take into account. The TOE framework stands for Technology-Organization-Environment. This framework examines the three elements and determines how they influence the implementation of a particular technology in the firm. Within this framework, the environment includes factors as the firm's competitors, customers, government, and the community. Using this framework for the implementation of AI into accounting firms illustrates the challenges that may arise for the firms. The employees must be willing to change the way they carry out their current activities, for example. This research is useful for this paper, because it looks at the different challenges and implications arising from different aspects of the framework. The framework identifies different aspects and types of contexts where AI can have an impact.

3.4.2 Challenges handling data

The research conducted by Rohmah et al. (2022) examines the potential challenges and implications that AI may pose for accounting practices and data. This research examines how certain accounting practices can change with the use of AI and what challenges may arise from this implementation. An example is the need for improved data protection. AI relies on the cloud to gather and store the data, which makes it more vulnerable to data loss. Research from Northey et al. (2022) demonstrated the effect of AI on the level of trust customers place in their financial advice. Financial advice that is created by humans gives the customer trust and they believe in what they are being advised. When AI is used to create financial advice, this trust and believe decreases. Customers are not yet fully trusting advice created by AI, as many of them have no or limited experience with AI. This creates a different type of challenge for the accountants when using AI.

The implementation of AI may pose several challenges, including the vulnerability of the data and the need for trust in the applications and results.

3.4.3 Current skillset of accountants

When using artificial intelligence systems or programs, the user must have knowledge about how to use them. According to research from Emetaram and Uchime (2021), the current skillset and knowledge of accountants are not sufficient to use AI for their accounting activities. The researchers concluded that accountants and accounting firms should improve their knowledge of AI in order to increase their performance using AI systems. When accountants improve their knowledge, not only will their performance improve, but they will also see that there is no need to fear that AI is going to take over their jobs. Not only do accountants need to increase their knowledge, but they also need to develop certain skills in order to get the most out of the AI systems. Accounting has become almost fully digital, which means that the accountants already have certain computer skills. When using AI, different skills may be required, especially to achieve the highest performance from of the AI systems. This indicates that artificial intelligence can be helpful in the accounting sector, but a big problem is the current knowledge of AI and the skillset of accountants.

3.5 Ethical impact and implications

Artificial intelligence creates opportunities and challenges for the firms, but how does it affect the ethical aspects of accounting activities.

Accounting practices typically involve working with a client's personal data to complete the accountants' daily tasks. When working with personal data, accountants need to handle the data carefully and ethically. Previous research from Zhang et al. (2023) has shown the ethical impact artificial intelligence can have on the accounting practices. When using artificial intelligence for accounting practices, ethical concerns may arise. In the research, a distinction is made between two types of ethical issues. The two types are: the ethical issues surrounding the implementation of AI and the ethical issues surrounding the use of AI. An example of the issues of the implementation is when accounting firms are more concerned about the security, privacy and misuse of AI working with internal and external data. When humans work with data from clients, they know how to handle this responsibly and ethically. AI does not take ethics and responsibility into consideration, which could cause concerns for accounting firms. Another issue can come from the developers of the AI systems choosing unnecessary but novel algorithms which lead to misleading results. This type of ethical issue is focused more on the ethical implications created by the AI systems and their developers. The other type of ethical issues are the issues in the use of AI. As the name suggests, it is about ethical issues arising from using AI for accounting practices. For example, the doubt about the AI's capability in analysing real data and dealing with complex scenarios. This doubt can be reduced by human intervention, which is still needed in the accounting practices. Another example is the result distortion issue, which can be divided in two types of distortion. The result distortion can occur because of inaccurate data input or data model. Managers can also misinterpret results for their own benefit and blame it on the result distortion of the AI system when someone finds out. This research suggests that ethical issues can arise from AI systems themselves, but the use and misuse of AI can cause problems in different aspects as well.

Previous research from Munoko et al. (2020) highlights the ethical implications that arise from using AI in accounting. They make a distinction between the various AI applications used in accounting and the issues that arise from these applications. This helps in determining which value of accounting practices are at risk when using AI. Furthermore, the paper provides suggestions for mechanisms to counter the issues. For example, if AI is used for analytics, there may be an impact on the privacy of the data when it is used by AI. Munoko et al. (2020) suggest a monitoring mechanism to monitor the application used and address any issues that arise.

3.6 AI used in the Big Four

There are various opportunities when using AI in the accounting sector, but it also presents various challenges. This results in various firms being afraid or unsure about implementing AI, as it is still a new development in this sector. Despite being quite unknown, there are a couple of firms that are already experimenting with AI or even using it already.

3.6.1 Deloitte as Frontrunner

In order to determine what impact AI can have on accountants their jobs, it is important to understand how AI is already being used by certain firms. An article by NOS (2024) describes how Deloitte uses AI for their accounting practices. Deloitte is implementing artificial intelligence in their statutory audits in the form of a linguistic model based on ChatGPT. This application tests whether the annual accounts comply with the accounting rule. Deloitte is one of the “Big Four” accounting firms in the Netherlands and is the most advanced in using AI. The other three accounting firms are currently testing with AI and implementing it into their practices, but on a smaller scale.

3.6.2 Current AI use Big Four

Previous research from Zhang et al. (2020) shows how the big four accounting firms (Deloitte, PwC, EY, and KPMG) use AI in some of their practices. The research shows the current use of artificial intelligence in the big four, as well as challenges and opportunities arising from these applications. These opportunities and challenges are based on existing AI applications used by accounting firms. IBM Watson is an example of such an AI application used by accounting firms for tax preparation. This application requires structured data in order to work optimally, which means the unstructured data needs to be structured. The process of structuring the data takes considerable time, which could be used to complete other tasks. In conclusion, the research provides an understanding of the current use of AI in accounting practices and the challenges and opportunities that arise from these applications.

3.7 Hypotheses

Previous research has shown different aspects of the usage of AI in the accounting sector. Based on this previous research, hypotheses for this study can be created.

Tout et al. (2014) and Iatridis (2010) show the important role accountants have in creating high quality financial statements for various users. High quality financial statements must be free of errors and should be prepared according to the reporting standards, but all humans make mistakes. Research from Yi et al. (2023) and Kommunuri (2022), showed how AI can take over repetitive tasks like data generating. This reduces the human mistakes, and the accountants have time to focus on other tasks. Artificial intelligence increases the quality of the statements by reducing the human mistakes.
Humans make mistakes, but they also sometimes make decisions based on their first feeling or opinion without using any information. This is called human bias and research from Souza, Niyama, and Silva (2020), showed how different types of human biases can influence the quality of financial statements as well. Human errors can be reduced by using artificial intelligence, and this also applies to human biases. Mohammad et al. (2020) showed that the use of AI for accounting activities can reduce the biases. Humans can be biased or have

personal judgements, but AI does not have these problems.
Humans make mistakes and this is also true when it comes to detecting fraud. Accountants are not always able to detect every case of fraud in certain financial data, as it can be challenging to see. Moudud-Ul-Huq (2014) showed that AI positively influences the fraud detection and helps accountants in detecting cases of fraud. With the use of artificial intelligence, the suspicious data or information can be more easily detected.
Previous research has shown that using AI for repetitive tasks reduces human errors and biases and improves fraud detection. Based on those previous studies, this research expects AI to have a positive influence on the quality of financial reporting.

Hypothesis 1: The use of artificial intelligence improves the quality of the financial reports from accountants.

Research from Kamyabi and Devi (2011), showed that accountants can be important for the performance of a company. Financial advice can help companies in different aspects, such as risk management or investments. The goal of giving financial advice is to get the maximum out of a company and help firms with their current business processes. Financial advice can help companies to make decisions in risk management or investments. Every client is different, and it can be difficult to determine what is the best financial advice for each client. That is where AI can help the accountants in creating useful and relevant financial advice. Research from Moudud-Ul-Huq (2014) and Tircovnicu and Hategan (2023), showed how AI can help accountants in making more accurate risk assessments for example. With a more accurate assessment, clients can receive better financial advice about what strategy to use for their risk management. AI can also help with the preparation of financial advice about investments, as the AI systems can make a more accurate analysis of a possible investment. That is why this research thinks AI can have a positive effect on this advisory role. Artificial intelligence can help in creating more accurate risk assessments and investment analyses.

Hypothesis 2: The use of artificial intelligence enhances the advisory role of accountants.

Research from Brougham & Haar (2018) investigated the different perceptions between the various ages working at an accounting office. The research of Brougham & Haar is focussed on the difference in attitude towards AI development between different ages. The research shows the younger employees often show a more positive and accepting approach to AI, compared to the older generations. Younger employees are more confident in the possible advantages of AI, while the older employees have more confidence in themselves. Younger generations are more acknowledged with the developments of AI, and how it can change the way accountants carry out their tasks. The older generations are less invested in these technologies and are less aware about the impact that AI can have on the accounting activities. Based on these findings, this research expects to show a difference between the different age groups in attitude towards the development and use of AI in the accounting sector.

Hypothesis 3: There is a difference in attitude towards the development and use of artificial intelligence in accounting based on age.

Alderman (2021) shows in their research the risk of an increase of the gender gap in accounting. In the current accounting market, women are occupying the jobs that are more likely to be taken over when AI is used. The women in those positions are probably aware of this development and they have a more scared attitude towards AI. The research from Ologe (2020) showed the difference between the acceptance and expectations about gender. The survey and t-test from Ologe showed the difference in attitude towards the use of AI in accounting. That is why this research is expected to show a difference in attitude towards the development and use of artificial intelligence in accounting between the different genders.

Hypothesis 4: There is a difference in attitude towards the development and use of artificial intelligence in accounting between the different genders.

4 Methodology

4.1 Experimental design

To gather the right data for the research question, a good experimental design is needed. This way the data from the respondents is usable within the research. To get an answer on my research question, quantitative analysis has been done to gather as much data as possible. Within quantitative research the focus lies on gathering numerical data and try to explain a certain phenomenon with this data. The method used to gather this data is the survey method. The whole of the population consists of all accountants, but there needs to be a smaller sample size. Non-probability sampling is used to create a smaller sample of the population in order to get the right number of respondents. For this research, there is no list of accountants or accounting firms available to choose from. This makes it non-probability sampling as accounting firms that are easier to approach are selected. The method of non-probability sampling used in this research is the convenience sampling method. With the convenience sampling method, the focus is on the respondents' accessibility and willingness to answer the survey. For this research, accessible accounting firms were asked to distribute the survey and ask accountants to answer it. By using this method, the sample size consists of people who are available and willing to answer.

When using a survey, it is important that the questions are formulated in such a way that all respondents understand what is being asked. When the questions are not clearly formulated, the respondents may not give their honest opinion or may not give an answer at all. This means that there is a possibility that biases arise from questions that are not formulated correctly. If there are biases present in the research, then the results are not what they could have been.

For this research, the targeted group of respondents are accountants from different firms. To gather enough data, different accounting firms are asked to send this survey to their accountants. All the accounting firms were approached via e-mail or LinkedIn to get enough respondents to complete the survey. By having respondents from different sized firms, the results and answers from these respondents can vary based on their current firm. The bigger sized firms are experimenting more with implementing artificial intelligence in their workflow, compared to smaller firms.

The survey is available in both Dutch and English to make sure all the accountants were able to answer the survey. To complete the survey, it costed the respondents only about 5 to 10 minutes. This approach does not take up a lot of people's time, which means they are likely more willing to complete the survey. To get the best results possible, the answers from the respondents are all fully anonymous. When the respondents can answer anonymously, their answers are likely to be more honest.

4.2 Survey

The aim of the survey is to get an answer on how the artificial intelligence influences the current activities performed by accountants. To test all the hypothesis, the survey is divided into four different sections. Every section is aimed at specific subject, and all the questions in these sections are used to test the hypothesis.

In the first section of the survey, general questions about the respondents are asked. The data gained from this general question block is age, gender, and work experience. Especially, gender and age are important to test the hypotheses. The gender and age can be used to test the hypotheses about difference in perception between gender and ages. Data from work experience might show interesting results as well. People with more work experience might show more confidence in their own ability compared to respondents with less work experience in the accounting sector.

The second section contains general questions about AI. These general questions ask the respondents about their familiarity with AI, as well as whether they already use AI in their current job processes. Using the data from these questions, it is clearer whether current firms already use AI and whether accountants are familiar with AI or the potential consequences.

In the third section, the respondents are presented with various statements. To answer these statements, the respondents receive five different answer options which range from strongly agree to strongly disagree. This way the respondents determine whether they agree with the statements presented. The main subject of these statements is the influence of artificial intelligence on current accounting practices. It starts with a statement on the potential loss of jobs that can be caused by AI. After that, there are statements which are aimed at the influence of AI on the financial statements. These statements are about the influence of AI on the human errors in the financial statements, or the influence AI has on the fraud detection. The last part of statements is about the influence of AI on the financial advice given by accountants. To determine the influence on the financial advice, the statements are aimed at the time available for creating the advice and the quality of the advice for the clients.

The final section of the survey is aimed at the respondents’ perception on the developments of artificial intelligence and the possible effects it can have on their jobs. In this section, the respondents received multiple statements, as well as a question on their opinion on the developments of AI. For both the statements and the question, the respondents were presented with five different answer options. In this final section, some statements are

aimed at assessing the influence of AI on accounting tasks. The other statements in this section address the potential changes in the skill set of accountants when AI is used in the accounting sector.
Certain outcomes obtained from the final section are combined with data gathered from the general questions in the first section to answer certain hypotheses. With the combination of the two sections, it is possible to analyse the difference in perception between the different ages and genders.

4.3 Statistical tests

To test the hypotheses of this research, tests are required to determine whether they can be accepted. For the first and second hypothesis, the data shows what the respondents answered on the statements aimed to test those hypotheses. Based on the results from the survey combined with data from previous research, the hypothesis can be accepted or rejected. For the purpose of these tests, a difference will be made between respondents with and without experience working with AI. The accountants with experience of AI already have a good idea about how the use of AI can influence their current accounting activities. To determine if there is a significant difference between the two groups, the t-test with unequal variances is used. The knowledge of what both groups think about the development can be combined with knowledge from previous research to determine whether the hypothesis can be accepted or rejected.

The third hypothesis relates to the difference in attitude of accountants between different ages. The dependent variable is the attitudes of accountants towards development and use of AI in the accounting sector. The independent variable is the age of the respondents. In order to determine the difference in attitude, the respondents were divided into different groups of different ages. This allows respondents of certain ages to be grouped together and their answers can be compared to the different groups. Based on the results of the survey, it is possible to evaluate the hypothesis. A one-way ANOVA test is used to analyse the difference between ages on their perception of the development of AI in the accounting sector.

The final hypothesis is intended to assess the difference in attitude between different genders of accountants. In order to analyse the data from the questions aimed at this thesis, a two-sample t-test with unequal variances is used. Again, the dependent variable for this hypothesis is the attitudes of accountants regarding the development and use of AI in the accounting sector. The independent variable is the gender of the respondents. As with the different ages, the genders will be divided into two different groups to analyse the differences in perception. This implies that the mean answers of female respondents will be compared to the mean answers of male respondents. The data is derived from the questions created to evaluate this specific hypothesis.

4.4 Limitations of the method

Within the research, there exist certain limitations that are hard to adjust for. To gather the respondents for this research, the convenience sampling method was used. The risk with using this type of sampling is the biases that could possibly occur. There is a possibility that the sample used in the study does not represent the population. This bias is called the selection bias (Arias, Navarro, Elfanagely, & Elfanagely, 2023). A type of selection bias that can occur is called the sampling bias. This type of bias can happen when the respondents who are easier accessible and are open to voluntarily fill in the survey are used. When this is the case, the conclusions can eventually be poor as these respondents share common traits, like working for the same firm (Loftus, 2022). This does not help in creating strong conclusions, as these respondents may have the same type of opinion or idea.

In this survey, the respondents are presented with statements regarding the influence of artificial intelligence. Several respondents may be unfamiliar with AI or have no experience of working with AI. When these respondents read those statements, it may be challenging for them to visualize how AI could potentially influence their current accounting activities. Respondents who have any familiarity with AI, or any experience of working with AI, have a better idea of how AI can influence their activities. The impact of AI can be viewed as both positive and negative. For the respondents with experience, it is easier to visualize what the impact can be if artificial intelligence is used. It may be more difficult for the respondents who are unfamiliar with AI to visualize what they really expect to happen. This suggests that respondents with less or no knowledge of AI would have answered differently if they had more knowledge about AI. It is difficult to account for these limitations, yet they may still have an impact on the outcomes of the research. The fact that these differences are not clear to see from the analysis and results makes it even harder to account for, but it can still influence the outcome of the research.

Another limitation of this research is the social desirability bias. Certain topics that receive much attention in society create a certain idea about what society thinks. This could something you agree with, or it could be something you disagree completely disagree with. In the survey conducted for this research, the respondents are placed in a situation where they must make a decision regarding an important topic. The respondents may select an option that they believe is the desired response from society, rather than what they actually think. This implies that their response is not reflective of their true feelings about the situation. The topic of artificial intelligence taking over people's jobs, is a topic that is frequently discussed, and society has mixed opinions about. Part of society is opposed to the developments of AI and its potential impact, while others believe it can be a great development. Respondents might want to use their answers to show that humans cannot be replaced by AI, as they believe this is the socially desirable answer. The actual thoughts of these respondents may be different from what they answered in the survey. Respondents might think society finds it unacceptable to think AI is helpful for humans and answer negatively. This limitation is impossible to overcome, but it still limits the research and its results.

5 Results

From the survey, analyses were carried out to determine what these numbers all meant. These analyses provide results and conclusions that help answer the research question. For example, a two-sample t-test to determine the difference in attitude between the different genders.

5.1 General statistics

At the of start the survey, the respondents were asked multiple general questions. This section consisted of questions about gender and age, as well as questions about work experience in the accounting sector and how familiar the respondents are with artificial intelligence.

The questions about age and gender are particularly important to test the third and fourth hypothesis, while the other statistics could help in explaining other results.

Table 1, Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Gender	127	1.417	.495	1	2
Age	127	37.283	11.17	19	62
Work Experience	127	1.969	.776	1	3
Familiarity	127	3.126	.816	1	5

Table 1 shows the descriptive statistics from the survey that was created for this research. The survey received 133 responses, but as shown in table 1, not all results were useful. Out of the 133 respondents, 6 did not complete the survey, which means there are 127 useful observations. To test the last hypothesis about the difference in attitude between genders, the gender of the respondents was categorised into different groups. The male respondents were categorised as 1 and the female respondents were categorised as 2. The gender mean is 1.417, which indicates there were more male respondents than female respondents. The statistics show that the average age of the respondents was 37.283 years. The youngest respondent was 19 years old, while the oldest was 62 years old. This indicates there are respondents from all different ages, which helps in determining the difference in perception of AI between different age groups.

The third question of the survey was aimed at the respondents' work experience, for which there were three answer options. The answer options ranged from less than 5 years of experience to more than 15 years of experience. Less than 5 years was categorised under 1, 5 to 15 years of work experience was categorised under 2, and more than 15 years of experience was categorised under 3. Table 1 shows that the mean of the answers on work experience is 1.962, which means that most respondents have between 5 and 15 years of work experience in the accounting sector.

The last question in the first section of the survey was a general question regarding the respondents' familiarity with AI. There were five answer options, which ranged from very familiar to very unfamiliar. The results indicate that the majority of respondents have some familiarity with artificial intelligence but not much. This familiarity could be people using ChatGPT or just having knowledge about the developments and possibilities of AI.

All statements of the survey with five answer options are ranked in the same way. The answer options are ranked from the very positive, to positive, to neutral, to negative, to very negative. All these answers were categorised from 5 (very positive) to 1 (very negative), which converts the responses into useful data for the tests. For example, if a respondent answered "agree" on a statement, the answer would be categorised under 4.

5.2 Financial Statements

5.2.1 Change in Accounting Activities

The first and second hypotheses are aimed at the quality of the financial statements when using artificial intelligence for certain accounting activities. The third section of the survey consisted of statements regarding the effect of using AI on the quality of the financial statements. At the start of this section, the respondents were presented with a statement regarding the potential impact of artificial intelligence on the way accountants carry out their tasks. The respondents were able to choose between 5 different answer options to give their idea regarding this statement. These answer options ranged from strongly agree to strongly disagree.

To determine the effects of AI on the accounting activities, there is a difference made between two groups. One group consists of respondents who have already worked with AI, and the other group consists of respondents without any experience of working with AI. Respondents with AI experience at work have experienced how AI can change their activities, which is why a difference between the two groups is made. The first section of the survey asked the respondents if they already work with AI for certain accounting activities. There were two answer options, the first one was just "no" if the respondents did currently not use AI in the accounting activities. The second option was "yes" if the respondents use AI in the accounting activities and they were asked to give an example as well. Using this data, a difference can be made between the two groups to determine how AI influences the different accounting activities.

Table 2, Change in activities

Group	Obs	Mean	Std err	Std. dev.	T value	p value
No AI experience	72	3.916667	.0733451	.6223536		
AI experience	55	4.454545	.0770595	.5714887		
Combined	127	4.149606	.0581758	.6556076	-5.0560	.0000

Table 2 shows the results from the survey question regarding the change of accounting activities. The difference between the groups is tested by using a t-test with unequal variances, which gives a p-value of 0.0000. This p-value indicates there is a significant difference between the two groups. The respondents with experience in the AI usage show a higher mean, compared to the respondents with no experience in working with AI. The mean of the respondents with AI experience is between the options of "agree" and "strongly agree". This indicates that accountants with AI experience believe AI changes the way that

accountants carry out their tasks. Respondents without prior AI experience may be unsure about how AI influences their current accounting activities. This group agrees with the statements as well, based on a mean that is close to 4. This indicates that the accountants without AI experience believe AI changes the way they carry out their tasks as well.
The combined mean shows that the 127 respondents believe that AI changes the way accountants carry out their current tasks. The combined mean is 4.150, which means that the average of the respondents agreed with the statement regarding AI changing the way accountants carry out their activities. Not only the respondents with experience expect AI to change the way accountants carry out their activities, but the accountants without experience as well.

5.2.2 Time for financial statements

Based on the results in table 2, it can be said that accountants believe AI is going to change the way accountants carry out their activities. One of those accounting activities is creating the financial statements. To determine how much the use artificial intelligence influences the quality of the financial statements there are multiple factors to look at. The financial statements are of high quality if they are useful for the decision-making process of users. To be useful, the financial statements need to be free of errors and include everything according to regulations that are made.

Artificial intelligence can be used for several activities within the accounting sector. When using AI for repetitive tasks, such as data conversion, the accountants could have more time to focus on other tasks. Creating the financial statements requires a lot of attention to make sure it includes everything and check for errors. If AI gets used to take over certain repetitive tasks, the accountants have more time to focus on the financial statements.
In the survey, a statement was aimed at AI taking over repetitive tasks and how this influences the time accountants have for making the financial statements. The respondents were presented with five answer options ranging from strongly agree, to strongly disagree.

Table 3, Time for financial statements

Group	Obs	Mean	Std err	Std. dev.	T value	p value
No AI experience	72	3.902778	.0630464	.5349667		
AI experience	55	4.127273	.1039766	.7711114		
Combined	127	4.000000	.0580911	.6546537	-1.8462	.0681

Looking at the results, the combined mean shows that all respondents believe accountants would have more time to focus on the creation of the financial statements when AI takes over the repetitive tasks. The p-value in table 3 shows there is no significant different with an alpha of 0.05, but with an alpha of 0.10 there is a significant difference. When using an alpha of 0.10, there is a significant difference between the accountants with and without AI experience, but the results are less strong. The respondents with AI experience show that they have more believe in AI giving accountants more time to prepare the financial statements. These accountants have experienced the use of AI for repetitive accounting tasks, and they have a better idea of how AI can impact the accounting activities. The accountants without AI experience believe in positive effect of AI on the time available for preparing financial statements as well. This additional time gives the accountants the opportunity to create more financial statements using the same amount of time as they used before AI. For example, previous research has shown that when the data conversion is done by AI, the accountants can use that time to focus on the financial statements of a client and create the same statement with less time used.

5.2.3 Human Errors and Biases

To create financial statements that are useful for the various users, there needs to be a truthful representation of the financial situation of a company. Every human makes mistakes, but the financial statements need to be free of errors to be as complete and truthful as possible. Humans can make mistakes, but humans can be biased as well. This can mean that the humans have a prejudice idea about a client or the financial situation of a client. For example, there is a client who operates in a market where several other clients with a bad reputation operate. The accountant could have a bias towards this client, which could lead to the accountant not giving a fully truthful representation of the company. These human errors and biases influence the quality of the financial statements, but AI can be used to take over certain tasks and reduce these human errors and biases. In the third section of the survey the respondents were presented with a statement regarding the decrease of human errors and biases when AI is used for repetitive tasks. For this statement the respondents were again presented with five answer options, ranging from strongly agree to strongly disagree.

Table 4, Human Errors and Biases

Group	Obs	Mean	Std err	Std. dev.	T value	p value
No AI experience	72	3.347222	.081639	.6952499		
AI experience	55	3.763636	.1216155	.9019246		
Combined	127	3.527559	.0723028	.8148110	-2.8397	.0055

The combined mean of the answers is 3.528 and this indicates that the average of all respondents is between neutral and positive. The accountants somewhat believe AI helps in reducing human errors and biases, compared to when the analyses are only done by humans. Table 4 shows that the respondents are positive about the effects of AI on the number of human biases and errors. Accountants with AI experience have a better understanding of how AI can help to improve the quality of financial statements. Respondents without this AI experience have to visualize the scenario, which may cause them to be less convinced about the influence of AI.
Table 4 shows the results from the survey to determine what accountants believe that the influence of AI is on the human biases and errors. The table shows that the p-value for this test is 0.0055, which means there is a significant difference with an alpha of 0.05. The respondents with AI experience show they are neutral to positive about the influence of AI on the human biases and errors. The average of these respondents shows they are more toward agreeing with the effects of AI on human errors and biases. This indicates that the AI experienced respondents believe in a positive effect of AI on reducing human errors and biases. The mean of the respondents without AI experience shows they have a positive believe about the impact of AI on preparing financial statements. This indicates group of respondents without AI experience share a similar believe, but are less convinced as the accountants with AI experience.

The accountants with and without AI experience share a similar perception regarding the effect of AI on human errors and biases. They believe that the use of AI reduces the number of human errors and biases, which increases the quality of the statements. The tests showed that respondents with AI experience are more convinced than the respondents without experience.

5.2.4 Fraud detection

The quality of the financial statements is based on the truthfulness and completeness of the financial data, which makes them useful for the users. In some cases, there are clients that try to get away with committing fraud, which can have an impact on the quality of the financial statements. Not only do the owners of the company try it, but sometimes employees of these companies try to commit fraud with assets or funds from the company they work at. It is up to the accountant to detect the fraud and make sure the right authorities are warned. When it comes to fraud that is committed by employees, the accountant should mention the suspicion or detection of fraud to the client. When the cases of fraud are not detected, the quality of the financial statements reduces.

Fraud can be hard to detect and notice, but accountants must try their best to find it and report it. Like with human errors and biases, humans do not notice everything, and this can be the same for the detection of fraud. That is why the next statement of the survey was aimed at how AI can help humans in detecting different types of fraud. The same five answer options were given to the respondents.

Table 5, Fraud detection

Group	Obs	Mean	Std err	Std. dev.	T value	p value
No AI experience	72	3.597222	.0731039	.6203071		
AI experience	55	3.927273	.1185051	.8788575		
Combined	127	3.740157	.0672756	.7581577	-2.3704	.0198

In table 5, the results from the statement regarding the help of AI in fraud detection are presented. The combined mean in the table is 3.740, which means there is a positive attitude towards the help from AI in the fraud detection process from both groups. The accountants believe the usage of artificial intelligence has a positive effect on fraud detection.

These results provide a clear image regarding the help AI can give to humans when it comes to detecting fraud. The p-value of 0.0198 indicates a significant difference between respondents with AI experience and respondents without AI experience. The respondents with AI experience are more convinced that AI improves fraud detection compared to when it is done by humans. The accountants without AI experience are between neutral and positive about the development but are still slightly optimistic. The accountants with AI experience know how AI can impact fraud detection during for example the data conversion.

help from AI in the fraud detection process from both groups. The accountants are positive about the usage of artificial intelligence to help in detecting fraud.

The results from the statements aimed at the quality of the financial statements show that the believe of accountants that AI can have a positive impact on the quality of the financial statements. The tables showed the accountants who have had experience in working with AI, are convinced the influence of AI can improve the quality of financial reports. The respondents with no AI experience are less convinced, but still optimistic about the influence of AI on the accounting activities. There is a positive attitude of all the accountants towards the help from AI on human errors and biases but help in fraud detection as well.
The accountants believe AI has a positive influence on the efficiency as well. AI takes over certain repetitive tasks, which gives accountants more time to focus on other tasks. This time can be used to create the same number of financial statements, but with a smaller amount of time than before.

5.3 Financial Advice

The creation of financial statements is an important task of the accountants, but giving clients financial advice based on the financial reports is just as important. The goal of financial advice is to help clients get the most out of their company, based on the financial information of the company. Every client has a different type of company and their own goals, that is why the accountant needs to approach and instruct every client in a different way. Previous research has shown that some clients can be difficult to manage or communicate with, while others are easier to handle. This is why accountants need enough time and accurate data to prepare the correct advice for all the different clients. The quality of the financial advice is not only about the communication with the client, but it needs to be useful for the client as well. The financial advice should help the client in making decisions about investments or risk management. To help in those decision-making processes, investment analyses and risk assessment need to be created. That is where artificial intelligence could be helpful for humans.

5.3.1 Time for preparation of financial advice

The time needed to prepare financial advice can be different for every client. This depends on the type of client because some of the clients are easier to deal with than others. For example, some clients have a complex company or are difficult to communicate with. These clients take a considerable of time, while other smaller clients are easier to deal with and create financial advice for. To get as much time as possible, the usage of artificial intelligence can help the accountants with repetitive tasks. The survey included a statement regarding AI taking over the repetitive tasks and giving accountants more time to focus on the creation of financial advice for their clients. The same format of answer options was used, where the respondents were presented with five answer options ranging from strongly agree to strongly disagree.

Table 6, Time for financial advice

Group	Obs	Mean	Std err	Std. dev.	T value	p value
No AI experience	72	3.958333	.0725068	.6152407		
AI experience	55	4.145455	.0914462	.6781834		
Combined	127	4.039370	.0574437	.6473582	-1.6034	.1117

The time needed to create good and useful financial advice can vary a lot per client. Table 6 presents the results from the statement regarding the increase in time accountants have by using AI. The table shows whether accountants believe AI can help them by taking over repetitive tasks and creating more available time for preparing financial advice. The combined mean of the answers by the accountants is 4.039, which indicates that the average of the respondents agrees with the statement. This mean indicates that the accountants are positive about the use of artificial intelligence for repetitive tasks to give them time to focus on preparing financial advice. The results show there was a p-value detected of 0.1117, which is not less than the alpha of 0.05. This indicates there is no significant difference between the groups of people with AI experience and people without AI experience. Both groups are positive about the influence AI can have on the time accountants have for creating financial advice.

This way, the accountants get more time to analyse the financial data and information and prepare useful and truthful financial advice. AI takes over repetitive tasks and gives the accountants more time to focus on the financial advice for their clients. Using AI, accountants can provide financial advice to the same number of clients in less time or use the time to better prepare based on previous advice and communication.

5.3.2 Financial Advice about Investments and Risk Management

When accountants provide financial advice to clients, the accountants want to help them get the most out of their company. The accountants give the clients advice about, for example, risk management. Risk management is about the process of identifying and controlling the risk for a company. After the risk is identified, the accountant starts assessing what impact the risk could have on the company. With that knowledge the company can try to control the risks and make sure it does not affect the business process. There are several types of risk, for example financial, legal or security risks (IBM, sd). Especially, for the financial risks the accountants can be helpful for a client to make sure the company does not get in financial problems. To help the companies, the accountants try to prepare financial advice that is useful and of the highest quality possible. For risk management, the accountants must help the client in assessing and tackling certain risks.

Risk management is important for a company, but making the right investing decisions is important as well. Sometimes companies are unsure about whether to make a certain investment. The accountant can help the client in these situations and give them financial advice about those investments. The accountants use investments analysis to prepare the advice. When making financial advice for investing, the accountants need to take different aspects into consideration, such as potential impact on output from the investment. These are aspects for when a company buys a certain machine for example, but financial advice could be about investing in stocks as well. When considering stocks, financial advice should include analyses of potential future performance or price movements. The financial analysis can help accountants prepare financial advice to help clients make correct decisions regarding investments.

Financial advice of high quality can help clients in deciding for several types of investments. It can be difficult for humans to take everything into consideration and create complete and useful financial advice. In the survey, respondents were presented with a statement regarding the use of AI to help prepare financial advice. This statement was aimed at the help AI can give to humans when creating financial advice about investments or risk management.

Table 7, Help in Creating Financial Advice

Group	Obs	Mean	Std err	Std. dev.	T value	p value
No AI experience	72	3.500000	.0839181	.712069		
AI experience	55	3.654545	.1353837	1.004032		
Combined	127	3.566929	.0754858	.8506818	-0.9703	.3344

The results of the survey are presented in table 7, which shows how accountants feel about the use of AI to help create financial advice. The test shows there is no significant difference between the respondents with and without AI experience. This means that the respondents have a similar idea about how AI can help in the creation of financial advice.
The table shows a combined mean of 3.567 from the 127 respondents. This indicates that the accountants are neutral to positive about the use of AI to help them in creating financial advice. The combined mean shows the average of the respondents are somewhat agreeing with the statement, but some are still unsure. Table 7 shows that accountants with AI experience are more positive towards the help AI can give them in preparing financial advice. The standard deviation is closer to 1 as well, compared to for example, the standard deviation in table 6. This indicates that the answers vary more for this statement than for the statement in table 6. Especially the responses from respondents with AI experience vary more based on the standard deviation.

The respondents agreed with the statement about AI giving the accountants more time to create the financial advice. With this time that is available for accountants, they can create financial advice that can help clients in getting the most out of the company. The other statement was aimed at the help AI can give to accountants when preparing financial advice for decisions in risk management and investments. Respondents showed a positive attitude towards this statement and mostly agreed with the statement. The accountants with AI experience are more positive in both statements, but they have experienced the influence AI can have on accountants. For accountants without experience, it is more difficult to visualize how AI can help in making financial analysis of investments.

5.4 Attitude of different ages

At the beginning of the survey, the respondents were presented with three general questions. One of these general questions being about the age of the respondents. As seen in table 1, the average age of the 127 respondents was 37,283 years. The oldest respondent being 61 years old and the youngest being 19 years old. In order to determine the difference in attitude towards the development of AI between different ages, the respondents were divided into four different groups. The choice of four groups was to have a good distribution of the number of respondents across the groups. Otherwise, it is possible that one of the groups has significantly more respondents compared to a different age group. The youngest age group ranges from the age of 19 to the age of 28. The second group consists of the ages between 29 and 35. The respondents aged 36 to 45 are categorised into group three, and the oldest group consists of the respondents from 45 years and older. By using this division, the results can show how the different age groups compare to each other. The age groups show a nice spread between all the different ages and the difference in perception that can be seen.

5.4.1 Human Replacements

As seen earlier in the paper, there are some accountants who fear their current jobs and activities in the accounting sector because of AI. To determine if there is a difference in perception about a potential human replacement because of AI, two questions of the survey can be used. These are questions aimed at determining whether the respondents believe that AI will replace humans or whether AI will take over certain accounting activities. Using the answers to these questions, it is possible to determine if there is a difference between the ages. Both questions are aimed at the same aspect and testing them separately gives a similar outcome. That is why these two questions are tested at the same time. For both of these questions, the respondents were given five different answer options, meaning that the mean of the answers ranges from a minimum of 2 to a maximum of 10.

To determine the difference in perception between the different age groups, a One-way ANOVA test was used. With this test, the effect of individual characteristics, such as age, on the perception of the development of AI in accounting can be conducted.

Table 8, Human Replacement

Age	Mean	Std. Dev.	Freq.
19-28	7.3636364	1.5775412	33
29-35	7.7419355	1.38967	31
36-45	7.59375	1.5420844	32
45+	7.8387097	1.6552296	31
Total	7.6299213	1.5368652	127

When using the One-way ANOVA test, it needs to meet certain assumptions. One of the assumptions of the One-way ANOVA is that the data needs to be normally distributed (Laerd

Statistics, 2018). In order to verify the normality of the distribution, the Shapiro-Wilk test was conducted. The data is normally distributed when $p > 0.05$ and the test showed, $p=0.29309$. This indicates that the data was normally distributed, but further analysis is needed to determine the homogeneity of variances. To test for the homogeneity of variances, the Levene's Test is used. This test revealed a p value of $p=0.8334$. This is not significant, indicating that there is no significant difference of perception between the age groups. After conducting an ANOVA test, the results showed a significance level of $p = 0.6319$. The significance level must be below 0.05 for the difference to be significant. This implies that there is no significant difference in the perception on the human replacement between the different age groups. In table 8, a slight difference can be seen between all the different age groups. The mean increases together with the increase in age from the youngest group to ages of 29 to 35. Between the second and third groups, there is a slight decrease, after which there is again an increase when looking at the oldest group. The difference between the younger and older generations means that the older generation have a higher expectation of AI replacing humans or taking over activities in the accounting sector. The results show that the differences are only minor and the p-value showed there is no significant difference between the groups.

When the two questions are tested separately by using the One-way ANOVA test, they are both still not significant. Both mean values of those tests are close to the mean of this test, so it does not differ from the results of this test.

What can be taken away from this test is that all of the age groups believe that AI could possibly take over parts of jobs or activities within the accounting sector. Another thing that can be taken away from this is that the older generation is more concerned about the development of AI and the future of their jobs, compared to the younger generation. The test, however, showed there is no significant difference, which should be taken into account when looking at the differences.

5.4.2 Enthusiasm over AI development

The development of artificial intelligence can create mixed opinions within society. In the survey, respondents were presented with a statement regarding the development of AI in the accounting sector. This was to assess the enthusiasm of accountants for AI in the accounting sector. The respondents were asked to choose between 5 different answer options to give their idea about the statement. The answer options ranged from very positive to very negative. To determine whether there is a difference between the enthusiasm of accountants in different age groups, the One-way ANOVA test was used again.

Table 9, Enthusiasm for AI development

Age	Mean	Std. Dev.	Freq.
19-28	3.5151515	.90558034	33
29-35	3.7741935	.71692293	31
36-45	3.34375	1.0957212	32
45 +	3.0645161	1.181397	31
Total	3.4251969	1.0119891	127

The survey question used for this test was a question with five answer options. This means that the averages are lower than what can be seen in table 8.

Similar to table 8, the ANOVA-test was used, and it has to meet a couple of assumptions. The Shapiro-Wilk test indicated that the data for this test was not normally distributed. The p-value was 0.00844, which indicates that the data is not normally distributed. When using the ANOVA test this is not necessarily a problem. The ANOVA test is a robust test, which means the normal distribution can be slightly violated and still provide valid results (Laerd Statistics, 2018). The results from the Levene's test showed a p-value of 0.0250, which indicates it is significant. This means there is a significant difference in enthusiasm between the different age groups. When looking at table 9, it can be seen that the oldest generation of respondents are the least enthusiastic about the development of AI in the accounting sector. Another noteworthy aspect is the relative high level of enthusiasm for the group of respondents between the aged between 36 and 45, compared to the group aged between 29 and 35. The oldest age group is the least enthusiastic about the development of AI compared to the other age groups. The oldest generation is the only group where the mean is below 3, which was the neutral answer.

The difference between the age groups can be caused by the younger generations knowing more about AI and their potential usage. In the first section the respondents were presented with a question regarding their familiarity with AI. That is why the results from the first section of the survey include data about the respondent's familiarity with AI.

Table 10, Familiarity with AI

Age	Mean	Std. Dev.	Freq.
19-28	3.5454545	.61699418	33
29-35	3	.81649658	31
36-45	3.125	.75134288	32
45 +	2.8064516	.90992142	31
Total	3.1259843	.81642004	127

Table 10 uses the data from the first section and to illustrate the average familiarity of each age group with AI. The respondents were again given five answer options, ranging from very familiar to very unfamiliar. Table 10 shows the results of a One-way ANOVA test on the difference in familiarity with AI between the different age groups. This data could help explain the significant difference in enthusiasm for AI development. Table 10 indicates that the youngest age group is the most familiar with AI, while the oldest age group is the least familiar. Like in table 9, the familiarity with AI is higher for the group of respondents between 36 and 45 years old, compared to the respondents aged between 29 and 35. Both tables 9 and 10 show similar differences between all the groups.

In a society where almost everything is digital, it is not surprising that the younger respondents are more familiar with AI. With this knowledge, it is possible to further explain the results from table 9. The older generation is less familiar with AI, which that means the older respondents are less aware of the possible advantages and opportunities AI could bring to the accounting sector. The younger generation is more familiar with the technology of AI, which makes them more aware of the potential of artificial intelligence programs and systems. This can enhance the enthusiasm from the younger generations compared to the older generations.

5.4.3 Change in Skillsets

When AI is used within the accounting sector, some accountants may not have the IT-skills necessary to work with artificial intelligence. This means that the current skillset of accountants may need to be updated and that students should be educated on the necessary IT-skills. If artificial intelligence is used to help accountants with their current activities, they need to know how to operate the different systems and programs. When employees lack the necessary skillset to operate AI systems and the firm implements AI, the firm may get more out of using AI when the employees develop their skillset. To test whether accountants think they need to change their skillset and accounting students should be schooled differently, the One-way ANOVA test was used. In the last part of the survey, there was one statement aimed at the current skillset of accountants and one aimed at the current curricula of accounting students. For each statement the respondents, were again given five answer options, ranging from strongly agree to strongly disagree.

Table 11, Skillset and student curricula

Age	Mean	Std. Dev.	Freq.
19-28	7.4848485	1.3019508	33
29-35	8	1.1254629	31
36-45	7.59375	1.4996639	32
45 +	7.1935484	2.0399241	31
Total	7.5669291	1.535767	127

Table 11 illustrates how the different age groups feel about the current skillset of accountants and the current curricula of accounting students. What can be taken away from this test is that all age groups believe that the skillset of accountants needs to be developed when using AI. This can be seen in the total mean, which is 7.5669.
The Shapiro-Wilk test revealed that the data was not normally distributed, but as we saw before this is not necessarily a problem when using the One-way ANOVA test. From the ANOVA test, the p-value is 0,2222. This indicates that there is no significant difference in perception regarding the necessary development of skills or curricula between the different age groups. When looking at table 11, it can be seen that the results are divided when looking at the different age groups. For example, the 29-35 and 36-45 year groups both think there is more need for a change in the skillset of accounts compared to the youngest and oldest age groups. There is no significant difference in the perception about the current skillset of accounts of the different groups.. The respondents believe there is a change needed, but there is no significant difference in the perception between the different age groups.

Based on the results of the tests, it is evident that there was only a significant difference between the age groups regarding the level of enthusiasm about the developments of AI. The other tests showed that there was no significant difference, which indicates the third hypothesis should be rejected. There is no significant difference in attitude towards the development and use of artificial intelligence in the accounting sector between the different ages. Across the different tests, the age groups show a fairly similar attitude when it comes to the use and development of AI, except for the enthusiasm.

5.5 Attitude of different genders

Table 1 shows that from the 127 respondents, there were more male respondents compared to female respondents. In total, there were 74 male respondents, compared to 53 female respondents. At the beginning of the survey, respondents were asked a question regarding their gender. The respondents were provided with three answer options, namely male, female and would rather not say. All respondents answered male or female, which is why the data from this question was categorised in two groups. The males were classed as group 1 and the females were classed as group 2.

In the following section, the results from testing the fourth and last hypothesis are presented. To test these hypotheses, a two-sample t-test was used. The questions used to determine the difference in attitude between different genders are identical to the questions used to determine the difference in attitude between the different age groups.

5.5.1 Human Replacements

In the survey, there were two statements aimed at how likely it would be that AI will take over humans their jobs or activities in the accounting sector. To achieve a clear answer, the two statements are tested separately by using the unequal variances t-test. If the two statements were to be tested together, the outcome of the test would differ.

In a t-test with unequal variances, it is determined if there is a significant difference between the mean values of two groups of respondents. The difference in the number of respondents from each gender makes it an unequal variances t-test. Both questions are about AI replacing humans in different ways, but this first test is for the statement regarding AI fully replacing humans in the accounting sector. In order to determine whether the respondents agree with the statement, they were presented with five answer options, ranging from very likely to very unlikely.

Table 12, AI taking over jobs

Group	Obs	Mean	Std err	Std. dev.	t value	p value
Female	53	3.792453	.1273786	.9973305		
Male	74	3.810811	.1256979	1.081294		
Combined	127	3.803135	.0901604	1.016057	-.1026	.9185

According to table 12, both the male and female respondents share a similar feeling about whether AI will take over jobs in the accounting sector. The combined mean is 3.803, which indicates that the accountants think it is likely that AI will be used in such a way that some humans will be replaced in the accounting sector. The male respondents believe it to be more likely, but the difference is small. The results of the test in table 12, show a p-value of 0.9185. This means there is no significant difference between the two different genders. The means from the table indicate that both groups think the same, which is why it is no surprise there is no significant difference. The combined mean indicates that both genders somewhat expect AI to be used in such a way that it will take over accountants their jobs.

The next test is used to determine the difference in perception between the genders regarding AI possibly taking over certain activities in the accounting sector. This statement is about the possibility that AI replaces humans in certain activities, but not fully take over the jobs of the accountants. The respondents were again presented with five answer options for this statement, ranging from strongly agree to strongly disagree.

Table 13, AI taking over activities

Group	Obs	Mean	Std err	Std. dev.	T value	p value
Female	53	4.075472	.0965631	.7029897		
Male	74	3.648649	.109579	.9426345		
Combined	127	3.803135	.0901604	1.016057	2.9223	.0041

From the statement regarding the replacement of humans by AI in certain activities in the accounting sector, the results in table 13 were created. The aspect that stands out from the results in table 13 is that the female respondents agree more with the statement regarding AI taking over some of their activities in the accounting sector. The male respondents are less convinced that AI will take over some accounting activities they currently carry out. As shown in table 13, the p-value is 0.0041, which indicates there is a significant difference between the two groups of genders. The female respondents are more convinced about AI taking over certain tasks they currently carry out as an accountant. This suggests that the female respondents are perhaps more concerned about AI coming into the accounting sector.

There is no significant difference between the male and female respondents in table 12, but in table 13 there is. Both the male and female accountants have a similar concern about AI being used in such a way that it will take over humans their jobs. For certain accounting activities that they currently carry out, the females are more convinced that AI will take over these activities.

5.5.2 Enthusiasm over AI development

The next test is used to determine how enthusiastic the different genders are regarding the artificial intelligence development. Similar to the test for the difference between the age groups, this test is aimed at determining how the accountants feel about the development of AI in the accounting sector. In this test, the difference between genders is tested with the use of a two-sample t-test.

Table 14, Enthusiasm over AI

Group	Obs	Mean	Std err	Std. dev.	T value	p value
Female	53	2.849057	.1485201	1.081243		
Male	74	3.837838	.0839312	.7220031		
Combined	127	3.425197	.0897995	1.011989	-5.7961	.0000

Table 14 presents the results of the t-test on the enthusiasm for the development of AI and the difference between the two groups. The test presents a p-value of 0.0000. This p-value indicates that there is a significant difference in enthusiasm between the two genders. As shown in table 14, the female respondents are much less enthusiastic regarding the developments of AI in the accounting sector. The mean of the female respondents is 2.849, which is approximately 1 less than the mean of the male respondents, which is 3.837. This shows that the majority of the female respondents are negative or neutral about the development of AI. The group of male respondents shows that they have a more positive feeling regarding the developments. There are several factors that could be the cause of this big difference in enthusiasm.

Table 15, Familiarity with AI

Group	Obs	Mean	Std err	Std. dev.	T value	p value
Female	53	2.826087	.0795864	.6846278		
Male	74	3.324324	.01329863	.9019571		
Combined	127	3.133333	.0738434	.8089139	3.2148	.0019

The difference in familiarity may be one of the reasons there is such a significant difference between the enthusiasm of the genders. In table 15, the mean of the female respondents is lower than the mean of the male respondents, which indicates there is a difference in their familiarity with AI. The test showed that there is a p-value of 0.0019, which is less than the alpha of 0.05. This p-value indicates that the difference between the genders is significant. This outcome may help in explaining the difference in enthusiasm between the different genders. Male accountants are more familiar with artificial intelligence, which indicates that the male respondents have more knowledge about AI and the usage of AI. With this knowledge, the males may be aware of the potential benefits and possibilities that the use of AI could bring to the accounting sector. That could explain the difference in enthusiasm between the two different genders.

5.5.3 Change in Skillsets

When AI is used in the accounting sector, the accounting firms want to get the maximum out of the systems and programs. Accountants do not all currently have the required skillset to optimally use artificial intelligence programs and systems for their accounting activities. To determine whether the male and female respondents believe there is need to develop the skillset of accountants, the following test was conducted. In the survey, the respondents were presented with a statement regarding the need for accountants and accounting students to develop a new skillset to use AI in their accounting activities. Another t-test was used to determine whether there is significant difference between the male and female respondents. This is regarding the need for accountants and accounting students to develop their skills to use AI in their accounting activities. The two statements are again tested together as it does not make a difference for the outcome of the test.

Table 16, Skillset development

Group	Obs	Mean	Std err	Std. dev.	T value	p value
Female	53	6.886792	.2115332	1.539985		
Male	74	8.054054	.1561902	1.343599		
Combined	127	3.133333	.1362773	1.535767	-4.4391	.0000

The results in table 16 show there is a difference between the perception of the different genders regarding the skillset of current accountants. The p-value of the test is 0.0000, which indicates a significant difference between the two genders. The male respondents believe that current accountants and accounting students should develop their skillset in order to be able to use the AI systems in the best way possible. The females are less convinced that it is necessary to develop the current skillset and curricula of the accountants and accounting students. The difference between the genders is pretty large as seen in table 16. The female respondents are more neutral towards these statements, while the male respondents agree with the need for development.

At the start of the survey, general questions were asked, which could help explain the differences seen in table 16. The respondents were asked a question about whether their current firms already use AI for certain activities. This may provide more information regarding whether the male respondents already have experience of working with AI. For this question, the respondents were asked answer no if their firm did not use AI, and yes, with an example if the firm did use AI. For this test the responses were put into two categories. The responses of “no” or “I don’t know” were categorised together under number 1. The “yes” answers with examples were all categorised under number 2. This creates the possibility to test the difference in current usage of AI between the genders.

Table 17, AI usage in current firms

Group	Obs	Mean	Std err	Std. dev.	T value	p value
Female	53	1.264151	.0611391	.4450991		
Male	74	1.554054	0581776	.5004626		
Combined	127	1.433071	.0441427	.4974626	3.4351	.0008

Table 17 shows the difference in AI experience at work between the different genders. As shown in table 17, the p-value is 0.0008, which indicates there is a significant difference between the two genders. The male respondents show they already use AI for their tasks more than the female respondents. The mean of the male respondents shows that more than half of the respondents have AI experience. With this knowledge, it can be suggested that the male respondents have a better idea about how to use AI and what skills are needed. Together with the results in table 15, regarding the familiarity with AI, the male respondents have more knowledge and experience with AI. This helps explain the significant difference in their perception about the need for accountants to develop their skills.

Almost all the tests conducted show there is a significant difference between the female and male attitude towards development and use of AI in the accounting sector. The male group shows a more positive attitude towards the use of AI in accounting, while the females are more neutral and sometimes even a bit negative.

6 Conclusion and discussion

In the conclusion, answer to the research question is given using the results from the analysis. The discussion will focus on further interpretation of the results, limitations of this research, and the contribution of this research. At the end of the discussion, the recommendations regarding future research will be presented.

6.1 Conclusion

Artificial intelligence is currently a popular topic, and the systems and programs are used in various job markets. In some job markets, like customer services, AI even fully takes over the human jobs. In the accounting sector, artificial intelligence is currently not as popular as in some other job markets. As previous research showed, some accountants are uncertain about the development of AI and the effect on their current jobs. This research wanted to show what the effects of artificial intelligence can be on the accounting sector. That is why this research wanted to answer the question: "*What effect can the development of artificial intelligence have on the efficiency and effectivity of accountants their jobs?".*
A survey was distributed among accountants, from which the results were combined with findings from the literature review to answer this research question.

The results showed that AI taking over repetitive tasks, gives accountants more time to focus on other tasks. These tasks are for example preparing financial statements or advice. AI taking over repetitive tasks, means that accountants can prepare more financial statements and advice in the same amount of time as before.
Every human makes mistakes and humans can be unconsciously biased. The issue with these human errors and biases are that they decrease the quality of financial statements. Artificial intelligence helps accountants in reducing human errors and biases, which increases the quality of financial statements. When the financial statements are free of errors and biases, the statements become more useful and relevant for the various users, like investors.
Fraud detection is important for the quality of financial statements as well. It is difficult for humans to detect all cases of fraud, as it is difficult to determine whether certain data is suspicious. When the accountants miss these cases of fraud, it decreases the quality of the financial statements. The findings of this research showed that artificial intelligence can be helpful in improving the fraud detection.

Previous studies and the findings of this research show that the use of artificial intelligence reduces the number of human errors and biases and improves fraud detection. This indicates that artificial intelligence increases the quality of the financial statements.

Accountants have an advisory role as well and this can be a complex and time-consuming task. Financial advice is about helping clients to get the most out of their company, by giving advice about risk management and investments, for example. This advice is based on analysing a clients' data and preparing an assessment based on that data. Artificial intelligence can help accountants in preparing these analyses and assessments, by for example converting and analysing the data. By using AI, the analyses and assessments are more accurate and based on data that is free from errors. This indicates that artificial intelligence enhances the advisory role of accountants.

The findings showed that there is a difference in attitude between different groups of respondents towards the development of AI in the accounting sector. The attitude difference can be seen between the different gender groups of the respondents. The male gender is more positive and open towards the development of AI in the accounting sector, compared to the female gender.
In the different age groups, there was no difference in attitude towards the development and use of AI in the accounting sector. All age groups had a similar idea about the development of AI.

This research has shown that AI has a positive impact on both the efficiency and effectiveness of accountants their jobs. The time to focus on other tasks and the increase in quality of financial statements and advice, shows a positive impact on the efficiency and effectiveness. This positive impact is created by using artificial intelligence to take over repetitive tasks and getting the most out of the accounting firm. Humans need to think about AI as their new digital colleague, instead of competition for their jobs.

6.2 Interpretation

With these results, some of the hypotheses from this research can be rejected, but other results are in line with them. That is why in the next part of this research the further interpretation of the results will be discussed. The hypotheses will be rejected or accepted based on the findings from this research combined with the knowledge from previous research.

The first two hypotheses were aimed at the effects of AI on the current accounting activities. One of the accounting activities is the creation of financial statements, but how does AI influence this activity? The first hypothesis is about the positive influence of AI on the quality of financial statements. This hypothesis was based on the research from Yi et al. (2023), Kommunuri (2022), Mohammad et al. (2020) and Moudud-Ul-Huq (2014). These studies presented a positive effect of the use of AI on the quality of financial statements. The quality of financial statements is about how truthful and complete the information is, which means it needs to be free of errors and according to the reporting standards. The findings of this research showed that accountants believe in this positive effect on the quality of financial statements. AI reduces the number of human errors and biases, which increases the quality of the financial statements. When AI is used to analyse data, it improves the quality of fraud detection as well. This means more cases of fraud will be detected and the information in the financial statements will be a true representation of the company. The use of AI reduces human errors and biases and improves the quality of fraud detection, which means the information in the financial statements are complete and truthful.
Knowledge from previous studies and the findings of this research are in line with the first hypothesis.

The second hypothesis was focussed on the impact of AI on the advisory role of accountants. Previous research Kamyabi and Devi (2011), showed how important useful and high-quality financial data can be for a company's performance. Each client needs different financial advice, which can be difficult and time-consuming to prepare. Research from Moudud-Ul-Huq (2014) and Tircovnicu and Hategan (2023) showed how AI influences the advisory role of accountants. Artificial intelligence helps to create more accurate risk assessments and investment analysis. This helps accountants to prepare better financial advice for each client, with the goal of getting the maximum out of the company. The findings of this research showed a similar image regarding the influence of AI on the advisory role of accountants. This study showed that accountants believe AI positively influences the advisory role. AI helps the accountants with the conversion and analysis of data. This helps them create better and more accurate assessments and analyses to prepare higher quality financial advice. Based on the previous studies and the findings of this research, the second hypothesis can be accepted.

The other two hypotheses were focused on the difference in attitude towards the development of AI between the different genders and age groups. The hypothesis regarding the difference in attitude between the different age groups was based on research from Brougham & Haar (2018). This research showed there is a difference in the attitude towards the development and use of AI in the accounting activities between different ages. The younger generation is more open towards new developments in technology, compared to people who are older. Based on previous research, this research expected to show a difference in attitude between the different ages. The previous research showed that the younger accountants are more positive towards the developments of AI, compared to the older generation. This research showed that there is no significant difference in attitude towards the development and use of AI in the accounting sector. This means the hypothesis can be rejected.
Only for the statement regarding the enthusiasm about AI, there is a significant difference between the younger and older generations. The results of the tests for other statements showed that there is no significant difference between the different age groups.

Research from Ologe (2020), showed there is a difference in attitude regarding the development and use of AI in the accounting sector. Alderman (2021) showed that the gender gap can increase in the accounting sector, as females carry out more of the tasks that are most likely going to be taken over by AI. This could indicate that female accountants are aware of this development and makes them more concerned about the developments of AI compared to male accountants. Based on previous research, the final hypothesis of this research is about the difference in attitude towards the development of AI between different genders. This research expected that male accountants have a more positive attitude towards the development of AI. The results from this research are in line with this expectation and that is why the hypothesis can be accepted. This research showed a significant difference in attitude between different genders of the respondents. The findings showed that female respondents have less familiarity and experience with AI compared to male respondents. This could mean that female respondents are unsure about the influence of AI on the accounting sector.

6.3 Implications

When doing research, the goal is to contribute to current knowledge about the topic. In the accounting sector, there are different areas where the results and conclusions could be helpful.

Part of the survey created for this research was aimed at assessing the potential need for development of the current skillsets of accountants and the current curricula of accounting students. This research has shown that the respondents had mixed opinions regarding the current skillset and curricula. The majority of the accountants believe that the skillset of accountants and the curricula of accounting students should be developed for the use of AI in accounting. The results of this research indicated that accountants with experience of working with AI believe development is needed. This group of respondents possibly has a better idea about what skill are needed to use AI systems for accounting activities compared to accountants without AI experience. Previous research showed that accountants are required to improve their knowledge of AI and their skillset in order to achieve the optimal performance of the AI systems.

Based on the results of the survey combined with previous research, this information could be useful for companies that already use AI in certain accounting activities. It can be helpful in the way that it helps firms determine about the need to develop the skills of their employees.

Not only accounting firms can use this knowledge, but colleges or universities that lecture in accounting also can use it. As shown, the accountants believe the accounting curricula should educate students to use AI for accounting activities. The curricula should not only focus on the current and typical accounting activities, but also on the development of artificial intelligence. When doing this, students who graduate can be useful within companies who are looking into using artificial intelligence for their accounting activities or who are already using it.

A different part of the survey was aimed at determining what impact AI could have on the current accounting activities. This research showed that, based on previous research and the opinions from accountants, AI is useful and can help accountants in their daily tasks. Combining this knowledge with the possible need to develop the skillset of accountants can help accounting firms in making decisions about AI. This knowledge can be helpful for the decisions-making process when accounting firms are considering the implementation of AI. The knowledge of these two aspects combined gives the accounting firms an idea about the influence of AI on accounting activities.

6.4 Limitations

During the research, several limitations emerged that could have an impact on the results. The first limitation arose during the distribution of the survey. The research question was aimed at the influence of artificial intelligence on the current accounting activities. This created a research population consisting of people working in the accounting sector. With this population, the number of potential respondents immediately decreased compared to a study in which everybody can answer the survey. It turned out to be quite difficult to obtain enough respondents from distributing the survey.
To tackle this limitation different methods and contacts were used. To begin, colleagues were asked complete the survey, from which a considerable number of respondents was collected. After that, friends and family who work at accounting firms were asked to send the survey to their colleagues. The last method was using LinkedIn to ask accounting firms to spread the survey across their offices. Using these methods, the wanted number of respondents was obtained.

Another limitation is related to the places where most of the respondents work. These respondents were mostly colleagues or colleagues from friends and family. Most of them work at accounting firms in the more southern part of the Netherlands. Due to the job location of the respondents, the result is less generalisable, as most respondents work in the same part of the Netherlands and for same types of accounting firms. Many of the respondents work for large accounting firms, but not as large as for example the Big Four. As previous research showed, the Big Four have already been experimenting with AI extensively. In this research, a considerable amount of the respondents has no experience of working with artificial intelligence. When respondents have more experience with AI, like people working for the Big Four, the strength of the outcome increases. This because those accountants have experience of working with AI and know what influence AI can have on the accounting activities.
The fact that the respondents of this research are all more easily accessible and willing to participate indicates that there may have been a sampling bias. This means the respondents

do not accurately represent the whole population. Due to this bias, the results are less strong, and this influences the outcome of this study.

The statements presented to the respondents are based on fictional situations. For these statements, the respondents must visualize the impact AI could have on certain activities. This survey was about how accountants believe AI impacts the accounting activities. For respondents with experience working with AI, it is easier to visualize, but it can still be quite difficult. If the research had more resources, such as time and funds, there would be a possibility to research the real effects of AI on certain activities. This approach allows respondents to be presented with clear data regarding the effect of AI on the accounting activities. This survey presented the respondents with scenarios to determine the influence of AI on the accounting activities, which could give less strong outcomes.

In surveys about a topic that is talked about a lot and has mixed opinions can cause a social desirability bias. This bias is caused by how society think about certain topics. These ideas could influence respondents' opinions, which could influence the outcome of a research. With AI, it is possible that respondents answer a question based on what they believe to be the answer that is desired by society. In this research an attempt was made to tackle this limitation, by letting the respondents fill out the survey anonymously.

Artificial intelligence is still developing, and especially in the accounting sector, firms are experimenting with different ways to use it. Many of the respondents in this research have not yet used AI in their accounting activities, but it is possible that more of them will use it in the next couple of years. Artificial intelligence keeps on developing, which means that people their opinions could change throughout the years. This means that the result of this research could be completely different within a couple of years if AI continues to develop. This research is aimed at the current development and use of AI in the accounting sector. The future is unpredictable and because of developments of AI and in the accounting sector, the opinions of people can change.

As seen above, the respondents were difficult to find, and most of them were from a similar area of the Netherlands, which created a sampling bias. A relatively large number of respondents have no experience working with AI, which meant that they had to visualize the scenarios presented in the statements. These limitations make it that the results should be used carefully and always be put into context.

6.5 Recommendations for Future Research

For future research, it is possible to highlight and focus one of the other areas of the accounting sector. This means that the research could specifically focus on areas such as tax, audit, or another area of accounting. By doing this, it is possible to ask more in depth and technical questions regarding the influence of artificial intelligence on their activities. When the questions of the survey are more specific and in depth, the results give a clearer idea about what influence AI can have on that specific area. This research will provide a deeper understanding of the impact AI can have on the accounting activities of those areas.

When enough time and funds are available to do research, technical and specifically aimed tests can be carried out. These tests can be used to test the effects and impact of AI on the accounting activities. The data coming from these tests is more advanced and can be aimed at a certain area of the accounting sector. With the results from these tests, a clear image can be presented of how artificial intelligence influences the accounting activities. The data from those technical tests can be used to create questions for a survey as well. In this survey the questions can present the accountants with data and numbers from real scenarios. This survey can give a clear image about the perception accountants have on the development and use of AI in the accounting sector.

7. References

Akinadewo, I. S. (2021, September). Artificial Intelligence and Accountants' Approach to Accounting Functions. *Covenant University Journal of Politics & International Affairs, 9(1)*, pp. 40-55.

Alderman, J. (2021, March 10). Women in the smart machine age: Addressing emerging risks of an increased gender gap in the accounting profession. *Journal of Accounting Education*.

Arias, F. D., Navarro, M., Elfanagely, Y., & Elfanagely, O. (2023). Biases in research studies. In *Translation surgery* (pp. 191-194). Elsevier eBooks.

Benbya, H., Davenport, T. H., & Pachidi, S. (2020, January 8). Artificial Intelligence in Organizations: Current State and Future Opportunities. *MIS Quarterly Executive*.

Biagioni, L. F. (1975). Roles and Rules for Accountants. *Business Horizons*, pp. 67-75.

Borges, A. F., Laurindo, F. J., Spínola, M. M., Gonçalves, R. F., & Mattos, C. A. (2021, April). The strategic use of artificial intelligence in the digital era: Systematic literature review and future research directions. *International Journal of Information Management*.

Brougham, D., & Haar, J. (2017, January 24). Smart Technology, Artificial Intelligence, Robotics, and Algorithms (STARA): Employees' perceptions of our future workplace. *Journal of Management & Organization*, pp. 239-257.

De Souza, P. V., Niyama, J. K., & Silva, C. A. (2020). THEORETICAL ESSAY ON THE COGNITIVE BIASES IN JUDGMENTS. *USP Internation Conference in Accounting* (pp. 1-16). Sau Paulo: Revista Catarinense da Ciência Contábil.

Dehghanzade, H., Moradi, M. A., & Raghibi, M. (2011, November). A Survey of Human Factors' Impacts on the Effectiveness of Accounting Information Systems. *International Journal of Business Adminstration*, pp. 166-174.

Deloitte. (2021). *COVID-19 Operating in the 'new normal' - A backdoor to increased fraud risk?* Retrieved from Deloitte: https://www2.deloitte.com/ch/en/pages/financial-advisory/articles/covid-19-operating-in-the-new-normal-fraud-risk.html

Emetaram, E., & Uchime, H. N. (2021). Impact of Artificial Intelligence (AI) on Accountancy Profession. *Journal of Accounting and Financial Management*, pp. 15-25.

Griffin, O. (2019, October 6). *How artificial intelligence will impact accounting*. Retrieved from ICAEW: https://www.icaew.com/technical/technology/artificial-intelligence/artificial-intelligence-articles/how-artificial-intelligence-will-impact-accounting#:~:text=The%20calculator%2C%20using%20research%20by,number%20crunching%20and%20data%20analysis.

Hashem, F., & Alqatamin, R. (2021, November 5). Role of Artificial Intelligence in Enhancing Efficiency of Accounting Information System and Non-Financial Performance of the Manufacturing companies. *Canadian Center of Science and Education*, pp. 65-75.

Hetler, A. (2023, December). *What is ChatGPT?* Retrieved from TechTarget: https://www.techtarget.com/whatis/definition/ChatGPT#:~:text=ChatGPT%20is%20an%20artificial%20intelligence,%2C%20essays%2C%20code%20and%20emails.

Iatridis, G. (2010). International Financial Reporting Standards and the quality of financial statement information. *Internation Review of Financial Analysis*, pp. 193-204.

IBM. (n.d.). *What is Artifical Intelligence (AI)?* Retrieved from IBM: https://www.ibm.com/topics/artificial-intelligence

IBM. (n.d.). *What is risk management?* Retrieved from IBM: https://www.ibm.com/topics/risk-management

Kamyabi, Y., & Devi, S. (2011, August 31). Use of Professional Accountants' Advisory Services and its Impact on SME Performance in an Emerging Economy: A Resource-based View. *Journal of Management and Sustainability*, pp. 43-55.

Kommunuri, J. (2022). Aritificial Intelligence and the changing landscape of accounting: a viewpoint. *Pacific Accounting Review, 34(4)*, pp. 585-594.

Korinek, A., & Stiglitz, J. E. (2017). Artificial Intelligence and Its Implications for Income Distribution and Unemployment. *The Economics of Artificial Intelligence: An Agenda* (pp. 349-390). University of Chicago Press.

Koumbiadis, N., & Okpara, J. O. (2008, November). Ethics and Accounting Profession: An Exploratory Study of Accounting Students in Post Secondary Institutions. *International Review of Business Research Papers*, pp. 146-156.

Kruse, L., Wunderlich, N., & Beck, R. (2019). Artificial Intelligence for the Financial Services Industry: What Challenges Organization to Succeed. *52nd Hawaii International Conference on System Sciences*, (pp. 6408-6417). Hawaii.

Laerd Statistics. (2018). *One-way ANOVA using Stata*. Retrieved from Laerd Statistics: https://statistics.laerd.com/stata-tutorials/one-way-anova-using-stata.php

Lemos, S. I., Ferreira, F. A., Zopounidis, C., Galariotis, E., & Ferreira, N. C. (2022, December 30). Artificial intelligence and change management in small and medium-sized enterprises: an analysis of dynamics within adaptation initiatives. *Annals of Operation Research*.

Loftus, S. C. (2022). Data Collection: methods and concerns. In S. C. Loftus, *Basic Statistics with R* (pp. 17-25). United States: Elsevier eBooks.

Losbichler, H., & Lehner, O. M. (2021). Limits of artificial intelligence in controlling and the ways forward: a call for future accounting research. *Journal of Applied Accounting Research, 22(2)*, pp. 366-382.

McClure, P. K. (2018, April). "You're Fired,"Says the Robot: The Rise of Automation in the Workplace, Technophobes, and Fears of Unemployment. *Social Science Computer Review*, pp. 139-156.

Mohammad, S. J., Hamad, A. K., Borgi, H., Thu, P. A., Sial, M. S., & Alhadidi, A. A. (2020, April). How Artificial Intelligence Changes the Future of Accounting Industry. *International Journal of Economics and Business Administration*, pp. 478-488.

Moudud-Ul-Huq, S. (2014, April). The Role of Artificial Intelligence in the Development of Accounting Systems: A Review. *Social Science Research Network*, pp. 7-19.

Munoko, I., Brown-Liburd, H. L., & Vasarhelyi, M. (2020, January 8). The Ethical Implications of Using Artifcial Intelligence in Auditing. *Journal of Business Ethics, 167*, pp. 209-234.

NOS. (2024, March 6). *Accountantskantoor Deloitte laat controles door AI doen*. Retrieved from NOS: https://nos.nl/artikel/2511654-accountantskantoor-deloitte-laat-controles-door-ai-doen

Ologe, S. O. (2021, July 27). Perceptions on the Use of Artificial Intelligence in Accounting: An Empirical Study among Accounting Professionals in Nigeria. *Msc in Accounting & Finance Management*.

PwC. (2012). *Finance Effectiveness: Efficiency*. Retrieved from https://www.pwc.in/assets/pdfs/finance-effectiveness/fe_efficiency.pdf

Rohmah, K. L., Arisudhana, A., & Nurhantoro, T. S. (2022). The Future of Accounting With Artificial Intelligence: Opportunity And Challenge. *International Conference on Information Science and Technology Innovation*, (pp. 87-91). Yogyakarta, Indonesia.

Smalling, E. (2023, November 16). *Almost everyone uses ChatGPT, but students say they stop short of plagiarism*. Retrieved from Erasmus Magazine: https://www.erasmusmagazine.nl/en/2023/11/16/almost-everyone-uses-chatgpt-but-students-stop-short-of-plagiarism/

Stone, G. (2015, October 5). Power, dependence and frustration. *Meditari Accountancy Research*, pp. 250-275.

Tircovnicu, G.-I., & Hategan, C.-D. (2023, November). Integration of Artificial Intelligence in the Risk Management Process: An Analysis of Opportunities and Challenges. *Journal of Financial Studies, vol. 15*, pp. 198-214.

Tontiset, N. (2022). The Study of Factors Affecting on the Accounting Effectiveness of Listed Companies in the Stock Exchange of Thailand. *Academy of Accounting and Financial Studies Journal, 25 (7)*, pp. 1-14. Retrieved from Aca.

Tout, S., Ghazzawi, K., El Nemar, S., & Choughari, R. (2014). The Major Role Accountants Play in the Decision Making Process. *International Journal of Finance and Accounting*, pp. 310-315.

Varzaru, A. A. (2022, July 19). Assessing Artificial Intelligence Technology Acceptance in Managerial Accounting. *Electronics*.

Yi, Z., Cao, X., Chen, Z., & Li, S. (2023, November 16). Artificial Intelligence in Accounting and Finance: Challenges and Opportunities. *IEEE Access*, pp. 129101-129123.

Zhang, C., Zhu, W., Dai, J., Wu, Y., & Chen, X. (2023). Ethical impact of artificial intelligence in managerial accounting. *International Journal of Accounting Information Systems, 49*, p. 100619.

Zhang, Y., Xiong, F., Xie, Y., Fan, X., & Gu, H. (2020). The Impact of Artificial Intelligence and Blockchain on the Accounting Profession. *IEEE Access, 8*, pp. 110461-110477.

8. Appendix


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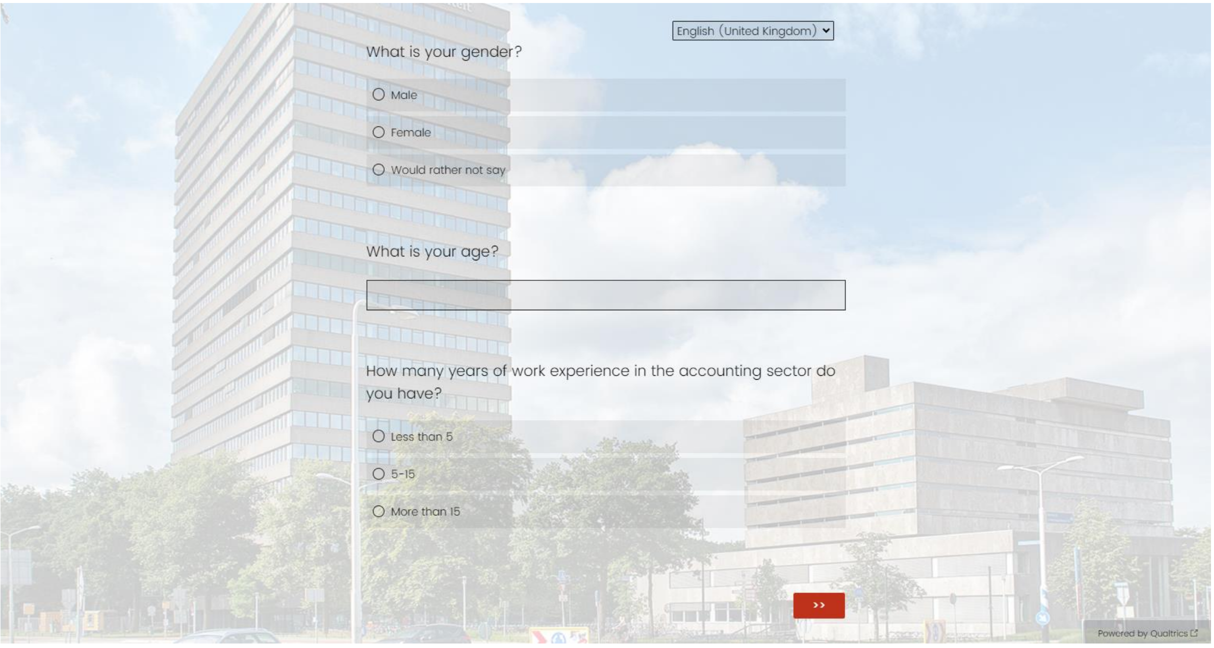
English (United Kingdom)
Welcome to this master thesis survey. This survey is part of a research on the use of artificial intelligence in the accounting sector.
As artificial intelligence is being used in multiple sectors and keeps developing, there are speculations about whether it can be used within the accounting sector and its processes. That is where this research aims to make a contribution.
The questions in this survey is on the use of artificial intelligence (AI) and the potential effect it can have on the accounting sector.
Answering the survey questions will take approximately 5 to 10 minutes. It is possible to answer the questions in either Dutch or English. When you go to a next page, there is no option to go back to the previous page. All of the answers are anonymous and will only be used for this research. Please try to answer as honestly as possible.
→


English (United Kingdom)
What is your gender?
Male
Female
Would rather not say
What is your age?
How many years of work experience in the accounting sector do you have?
Less than 5
5-15
More than 15
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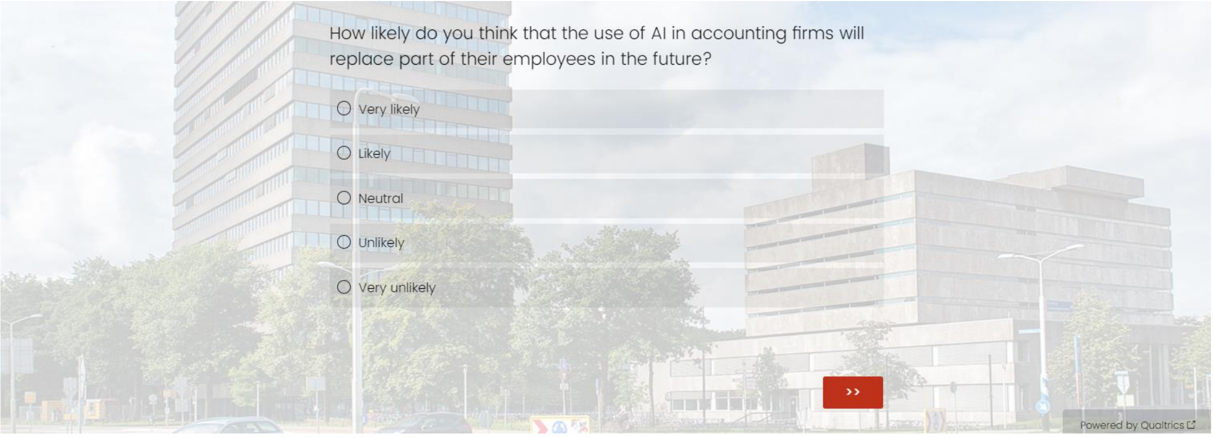
How familiar are you with artificial intelligence?

- Very familiar
- Familiar
- Somewhat familiar
- Unfamiliar
- Very unfamiliar

Is your firm already using AI in certain processes?
If no, just fill in no.
If yes, please give an example of the processes.



How likely do you think that the use of AI in accounting firms will replace part of their employees in the future?

- Very likely
- Likely
- Neutral
- Unlikely
- Very unlikely

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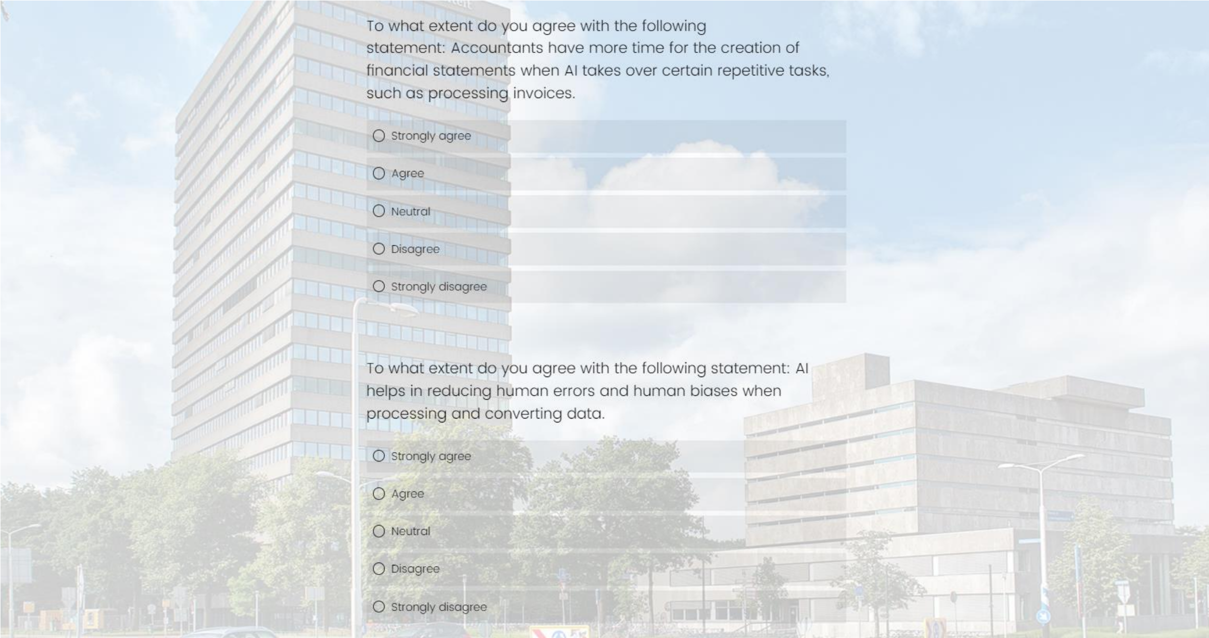
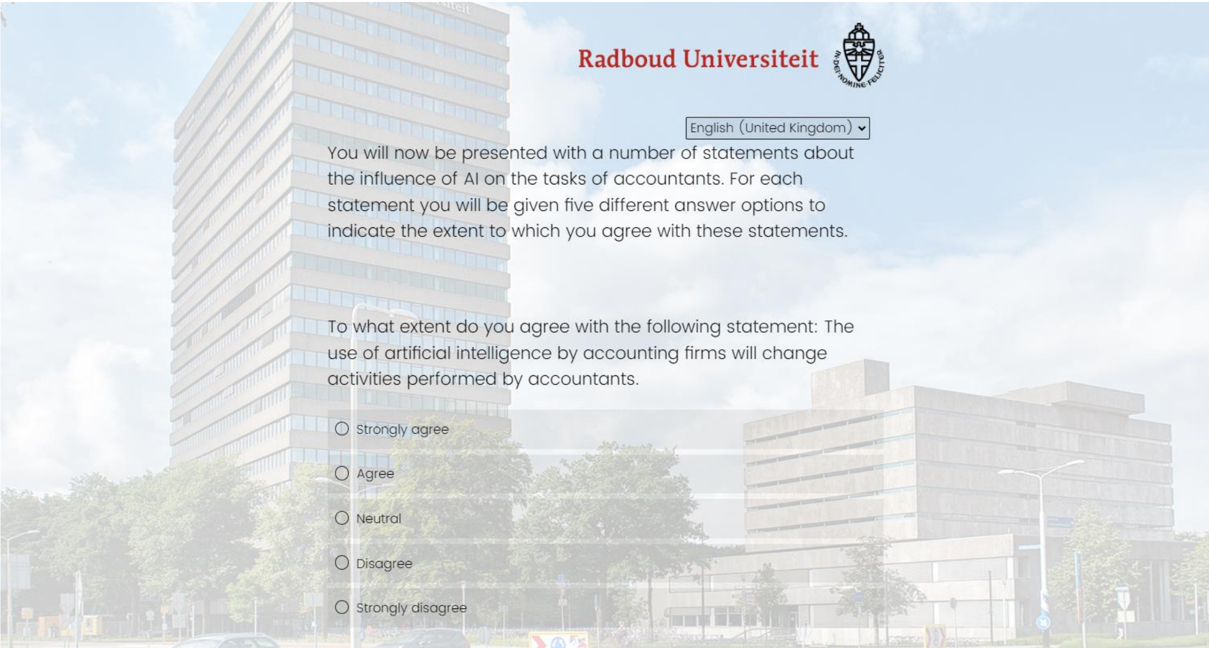


To what extent do you agree with the following statement: Accountants have more time for the creation of financial statements when AI takes over certain repetitive tasks, such as processing invoices.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

To what extent do you agree with the following statement: AI helps in reducing human errors and human biases when processing and converting data.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree



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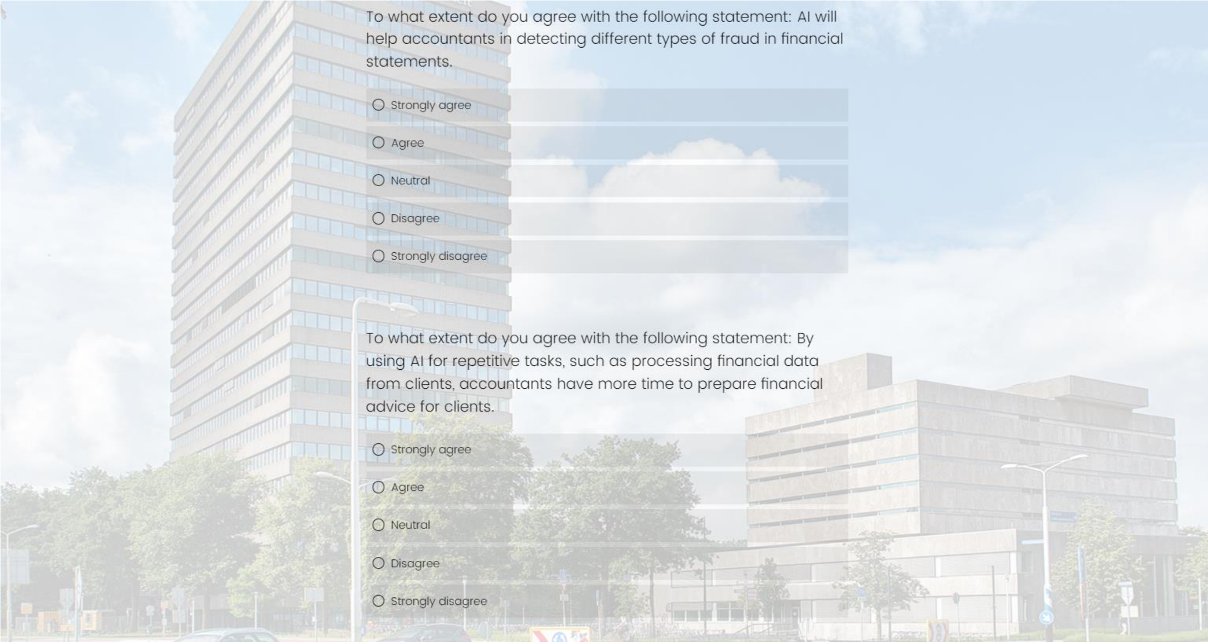
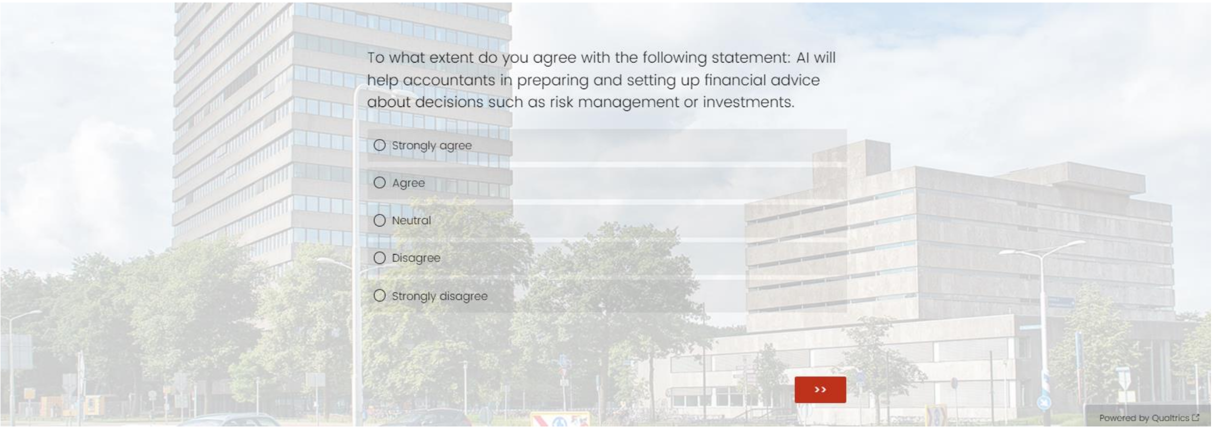
You will now be presented with a number of statements about the influence of AI on the tasks of accountants. For each statement you will be given five different answer options to indicate the extent to which you agree with these statements.

To what extent do you agree with the following statement: The use of artificial intelligence by accounting firms will change activities performed by accountants.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree


To what extent do you agree with the following statement: AI will help accountants in detecting different types of fraud in financial statements.
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
To what extent do you agree with the following statement: By using AI for repetitive tasks, such as processing financial data from clients, accountants have more time to prepare financial advice for clients.
Strongly agree
Agree
Neutral
Disagree
Strongly disagree


To what extent do you agree with the following statement: AI will help accountants in preparing and setting up financial advice about decisions such as risk management or investments.
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
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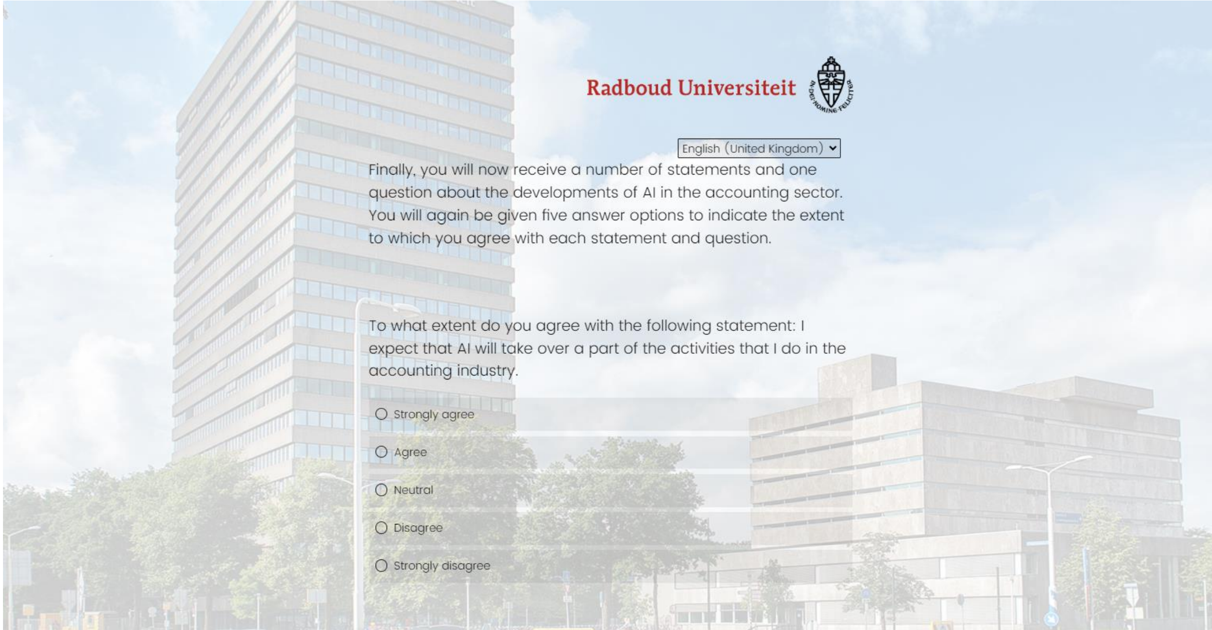

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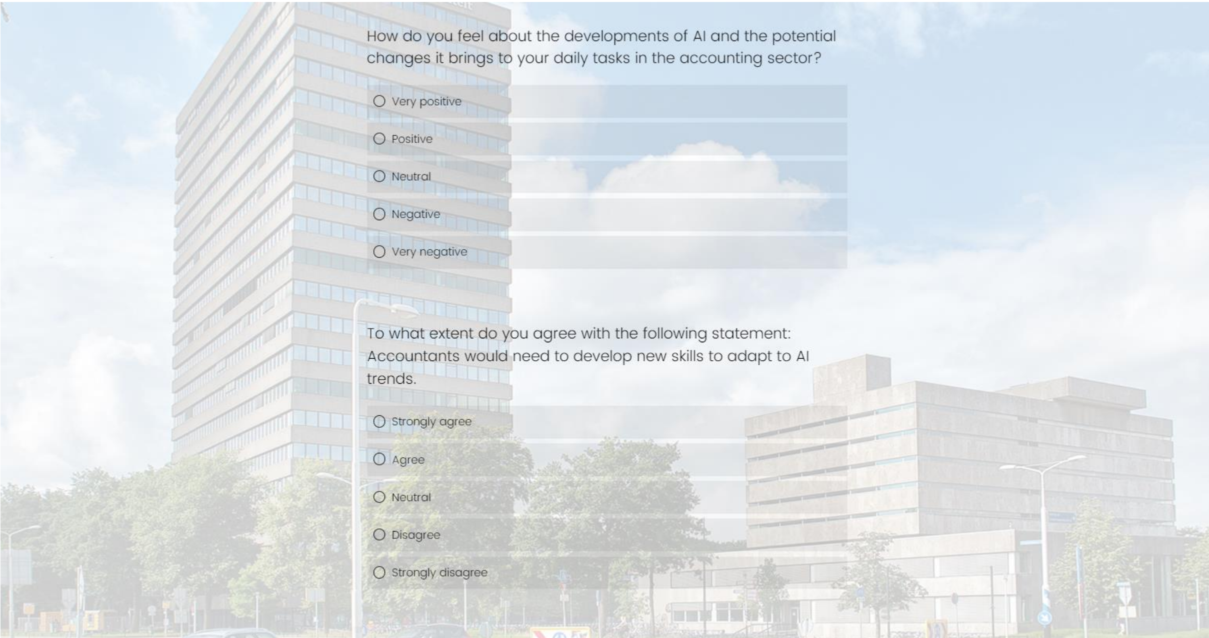
Finally, you will now receive a number of statements and one question about the developments of AI in the accounting sector. You will again be given five answer options to indicate the extent to which you agree with each statement and question.

To what extent do you agree with the following statement: I expect that AI will take over a part of the activities that I do in the accounting industry.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

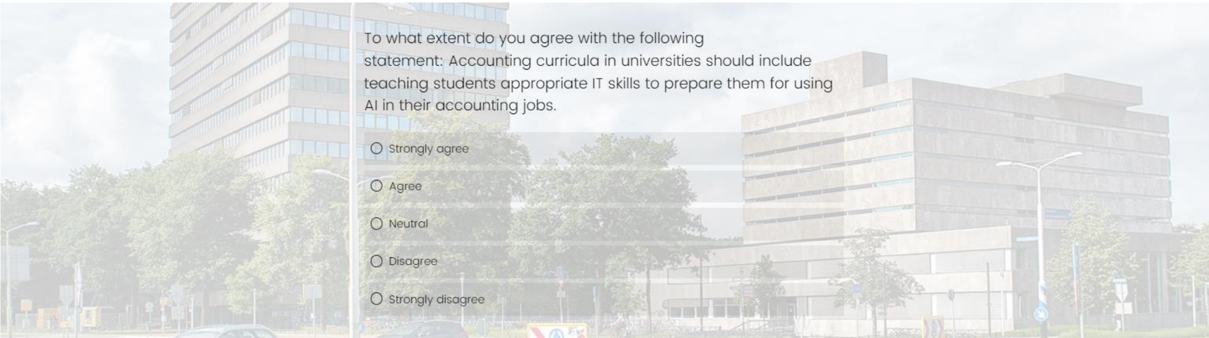


How do you feel about the developments of AI and the potential changes it brings to your daily tasks in the accounting sector?

- Very positive
- Positive
- Neutral
- Negative
- Very negative

To what extent do you agree with the following statement: Accountants would need to develop new skills to adapt to AI trends.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree



To what extent do you agree with the following statement: Accounting curricula in universities should include teaching students appropriate IT skills to prepare them for using AI in their accounting jobs.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree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This is the end of the survey.
Thank you very much for completing this survey.
The results will be included in the research.