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Higher education accounting students on developing AI and RPA competencies

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Artificial Intelligence (AI) and Robotic Process Automation (RPA) are current trend of information communication technology with heavy influence in almost every sector of human civilization. Finance and accounting are no exception.

This research-based thesis aims to study accounting students on developing artificial intelligence and robotic process automation in the field of financial accounting. The study also further develops the understanding of abilities and competencies needed for students to prepare for future challenges in the field of accounting and finance. Additionally, it also highlights accounting and finance student's opinion about their study curriculums and desired changes.

This thesis consists of a theoretical and an empirical section. The theory section mainly focuses on financial accounting, Robotic Process Automation, Artificial Intelligence, accounting competencies and its impact on accounting work processes as well as change in the work of an accountant. The empirical section focuses on the data gathered to answer the research objective.

The study involves qualitative research method in a form of semi-structure interview. The respondents are divided into two groups: Professionals and students. Interviewees participated are professionals in the field of accounting, AI, and RPA. Students participated are national and international.

The overall conclusion of the results was that the most change in accountants work are related to manual work, such as accounts payable, accounts receivable and bookkeeping. The work of an accountant in recent year is more focused on analysing, advising and interpretation of data. Students have a good understanding of accounting, but they do not possess the required skills in terms of technology. Universities and the University of Applied sciences should offer students with introductory courses on AI and RPA to help students pursue their accounting careers. Basics of programming and ability to understand algorithms are the high demand AI and RPA skills needed in accounting.

Keywords
Accounting competencies, Artificial Intelligence, Robotic Process Automation

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1 Introduction

Artificial Intelligence is a broad branch of computer science. It already has a huge impact on human lives and in the industry's (sub)sectors. In the last 150years, jobs have been historically eliminated, and more advanced jobs have been created. Accountants in the future may have a high chance of losing their job because of the machines taking over. It has been expected that roughly 35% of skills will change over the next decade (ICAEW 2019). The Financial Times reported that artificial intelligence tools are increasingly being used to replace work performed by new graduates, resulting in the prediction that companies will reduce their hiring of graduates. Roles such as general ledger, accounts receivable, and accounts payable are at risk. Nevertheless, accountants and students can upgrade their skills to minimize the risk of obsolescence. (Nagarajah 2016.)

Although technology had been developing for some time before, the emergence of the term "robotic process automation" can be dated to the early 2000. RPA is a software that enables users to automate and manage workflows using drag and drop features in a visual way that does not require any coding experience. (Ostdick 2016.) RPA is different from artificial intelligence, such as cognitive computing or machine learning, because it cannot learn from data patterns and use judgments to make decisions. When it comes to accounting, robotic process automation can do repetitive tasks such as extracting data from one file to another and copying pasting account information from different files. Everyday repetitive task of an accountant is now done by RPA software. (Deloitte 2018.)

1.1 Research Problem and Investigative Questions

The objective of this thesis is on accounting students developing artificial intelligence and robotic process automation competencies in the field of financial accounting. The rapid development of AI has also caused rapid changes in work processes in almost every sector. Due to this, the author of this thesis aims to highlight the need for students coming into the profession to understand the challenges of modern technology and the need for AI studies in universities curriculums.

The research question of this thesis is: How is Artificial Intelligence and Robotic Process Automation changing the work of accountants, and what challenges will it bring to accounting students?

There are five identified investigative questions (IQ), which will help collect the information to answer the research question. These are the following:

IQ 1. Why are businesses adopting AI and RPA technology in the field of accounting and finance?
IQ 2. How are AI and RPA influencing the accounting work processes?
IQ 3. What do accounting professionals consider to be the key AI and RPA competencies for new graduates?
IQ 4. How well are students prepared for accounting Jobs involving RPA and AI?
IQ 5. What knowledge/ skills have students acquired in AI and RPA at university?

The focus of this thesis is on accounting students on developing artificial intelligence and robotic process automation competencies in the field of financial accounting. Many industries have experienced an impressive change in 2020, and that excessively includes accounting. In the modern era of technology, accounting industries are adapting to the use of software, some methods of AI, and RPA, and in the future, accounting industries are predicting for accounting graduates to be advanced and well educated in the field of technology (Bell 2021).

The research does not intend to cover managerial accounting and will only cover financial accounting and briefly auditing. The research in the theory presents only relevant subfields of artificial intelligence mainly used in accounting and leaves out speech processing and vision. Speech processing and vision are not widely used in accounting work processes, so it would not be relevant to present in this research.

Accordingly, this thesis will cover the challenges for students to adapt to the change and demands of future accounting works. Also, the impact of the academic institutions on students in what they have been learning in their studies. Some part of it will also cover the demand for AI in the field of accounting.

The population to be studied was demarcated based on their specialisation. The population studied are the persons studying in UAS and Universities. The expert questions are distributed between the accounting advising companies and AI start-ups. The reason for distributing it to a specific organization is because the thesis is focused on accounting, and it gives value to the research.

The research method used in this thesis is the qualitative research method in the form of semi-structured interviews. The respondents are divided into two groups: Professionals and students. Professionals who participated in this research are from medium-sized companies. They are professionals in the field of accounting, RPA, and AI. Students who participated were accounting and finance students from Finland and abroad.

The overlay matrix below presents the investigative questions, related theoretical framework components, the research methods used, and the related chapter where the results are outlined. As this research is for International Business, the international aspect will be considered in the distribution of the interview questions to nationalities outside of Europe, specifically, to broaden answers, yet to prove that advanced technology impacts students around the world.

Table 1 - Overlay matrix

Investigative question	Theoretical Framework	Research Methods	Results (chapter)
IQ 1. Why are businesses adapting AI and RPA technology?	Academic literature; Artificial Intelligence, Robotic Process Automation. Chapter 2.2 & 2.3	Qualitative interview with AI and RPA professionals	4.1.1
IQ 2. How are AI and RPA influencing the accounting work processes?	Accounting, work processes, Subfields of AI. Chapter 2.1 &2.3	Qualitative Interview with AI, RPA, and accounting professionals	4.1.2
IQ 3. What do accounting professionals consider to be the key AI and RPA competencies for new graduates?	Accounting services, software, AI, RPA. Chapter 2.4, 2.4.1, 2.4.2, 2.4.3, & 2.4.4	Qualitative interview with accounting professionals	4.1.3
IQ 4. How well are students prepared for accounting jobs?	Accounting competences. Chapter 2.5	Qualitative interview with students	4.1.4
IQ 5. What knowledge have students acquired in AI and RPA?	Accounting competences, AI, and RPA. Chapter 2.5 & 2.3	Qualitative interview with students	4.1.5

1.2 International Aspect

Accounting is known worldwide, and the process of accounting firms and the way accounting is taught in academic institutions is similar around the world; therefore, the

results of the research topic is possible to discussed and applied by experts, institutions, and students globally.
The author of this project has lived abroad for a long period of time; hence, researching the Finnish standards in AI and RPA in accounting is an international experience.

1.3 Benefits

This part of the introductory chapter focuses on the benefits that the thesis aims to provide for academic institutions and students.

As technology is becoming progressively advanced in businesses worldwide, academic institutions need to find ways to appeal to their ministry of academic institutions about AI and RPA introductory courses/workshops. Every student starts their studies in the hope of becoming a valuable candidate for the job. Therefore, this research will help academic institutions know what students think of their offered degree program and what they can do to improve it.

Not all students are aware of technology advancement and with the term's artificial intelligence and robotic process automation. AI and RPA in accounting are paramount for students to know and prepare themselves for an accounting career. Therefore, this thesis will benefit them by making them aware of the change.

The author of the thesis benefits by conducting research on professional development. The author will benefit by understanding Artificial Intelligence and robotic process automation, which can be useful in the future work environment.

1.4 Risks and Risk Management

This subchapter of the thesis discusses possible risks involved with the thesis process and how the risks are mitigated. The risk is related to data collection and confidentiality matters.

At the very beginning, when the author started looking for possible interviewees, it was very challenging to find interviewees as all the accounting advisory companies were super busy, and they were unable to participate. To mitigate the risk of interviewee shortage, numbers were dialled, messages were sent through the LinkedIn platform, and several emails were sent.

Few companies were interested, but they were concerned of confidentiality matters. Companies interested had their people working in shared service, and AI professionals were working with products, and the information was fully confidential. The author let the companies know that it is possible to stay anonymous to mitigate the risk. In calls and emails, it was also explained what kind of information they provided may be published.

1.5 Key Concepts

Accounting competencies refers to skills and abilities required to perform a particular task in accounting. In accounting, the competencies are related to reporting the results of the work and data analysis, risk management, analysis and interpretation, research of frameworks and standards, and the capability to use tools and technology. (AICPA 2021.)

Artificial intelligence is the use of programs to enable machines to perform tasks that humans perform using their intelligence. Artificial intelligence can do things that are only designed in the system. They show accurate results and make work more efficient. (Duin & Bakhshi 2017.)

Robotic process automation (RPA) is the term used for software tools that partly or entirely automate human activities that are manual, rule-based, and repeated. They are not replacements of underlying business applications. Instead, they automate the manual tasks of human workers. (Aiim 2021.)

2 RPA and AI in Financial Accounting

This chapter of the thesis will define the impact of automation on the accounting field. This chapter aims to make readers understand the awareness of how robotic process automation and artificial intelligence are implemented in the accounting processes. Furthermore, it will compare and analyze the main concepts and the framework.

Figure 1 below shows the relevant key concepts for this thesis. The theoretical framework consists of financial accounting, Robotic Process Automation, Artificial Intelligence, and accounting competencies.

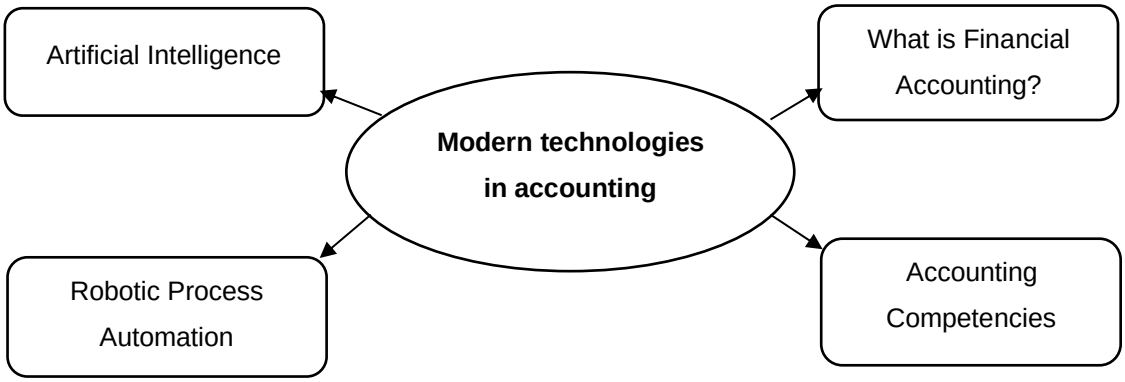

Figure 1 - Key concepts

2.1 What is Financial Accounting?

Financial Accounting primarily deals with recording, processing, and presenting historical information to external users. Financial accounting is concerned with preparing accounts for a business and then interpreting the data. It is subject to a detailed regulatory framework of accounting and legal rules. Financial accounting requires an accountant to understand how to collect and record data, prepare a trial balance, and produce a variety of financial statements for businesses. Additionally, an accountant needs to understand the accounting adjustments that companies frequently perform on their financial data. (Stittle & Wearing 2008, 4-6.)

In Financial Accounting, accounting professionals use first standardisation, double-entry bookkeeping. Every transaction in a business impact at least two accounts. Double-entry bookkeeping is a system in which every transaction generates two (double) entries. The transaction is recorded as a debit in one account and credit in another account. A rule of

double-entry bookkeeping is that debit must always be equal to credit. Double-entry bookkeeping provides the best method for tracking financial business growth and minimising human error in financial accounting. There are two bases of accounting. They are cash basis and accrual basis. According to the IFAC (International Federation of Accountants), many European countries use an accrual basis in preparing financial statements. The cash basis of accounting is more straightforward than the accrual basis. Under the cash basis of accounting, income and expenses are only recorded when the payment is received. However, it is believed that the cash method cannot accurately reflect a company's liabilities, assets, revenues, or expenses. Under the accrual basis of accounting, income and expenses are recorded when the service has been performed but the payment or service has not been made or delivered. (IFAC 2021, Gnanarajah 2014.)

As mentioned in the above paragraphs, accountants need to prepare a variety of financial statements for businesses. There are four main financial statements: balance sheets, income statements, cash flow statements, and statements of shareholder's equity. When preparing the consolidated financial statements, accountants in Europe needs to follow a single set of international standards. International financial reporting standards (IFRS), previously known as international accounting standards (IAS). IFRS is crucial as it provides a primary accounting language used by more than a hundred countries. Global companies interested in investing in stock usually look at the company's financial statements, so IFRS allows companies' financial reports to be understood and compared globally. They are international standards; however, each country follows its legislation if not publicly listed. Accountants need to understand the international compulsory rules and local rules to be able to apply them when preparing consolidated financial statements. (European Commission 2021.)

Inside most companies, the financial accounting role involves more than just preparing four primary financial statements. Supporting such statements and training information for internal management and the company outside auditors requires much analysis. This includes analysis of sales, bank reconciliations, and studies of different types of expenditure. Within the role of financial accounting, a typical finance department performs the following additional functions: handling of accounts receivable from customers (the sales ledger), controlling of accounts payable to suppliers (the purchase ledger), cash management, and potentially more comprehensive treasury functions including payments of cash, cash receipts, expenses, and banking relationships. A financial accountant is also typically responsible for payroll, whether processed internally or by an outside agency. (Thomas, Tietz, Harrison & Horngren 2019, 1-15.)

2.2 What is Robotic Process Automation?

Robotic Process Automation is defined as using specific technologies and methodologies based on coding algorithms and software applications to automate repetitive tasks performed by humans. Generally, the application is driven by simple rules and business logic while interacting with multiple information systems through existing graphic user interfaces. (Ivancic, Vugec & Vuksic 2019.) Robotic Process Automation is not a physical machine. Instead, it is a software program. RPA is used to make the process of particular work easier and faster. However, not all the functions in accounting are RPA- suitable. Incoming invoices are not immediately transferred as they arrive. Invoices are generally checked for correctness and legality before being transferred. If all the data is available in digital form, the entire process can be automated. If the information is unstructured, the optical character recognition (OCR) component must also be linked upstream to make the data editable by RPA. OCR is a technology used for the recognition of printed documents. Some OCR components help to convert the characters to editable text directly in the image. (Smeets, Erhard & Kaubler 2021, 42-45.)

Robotic Process Automation can already carry out many tasks, including basic tasks that need humans to work on, it now can be replaced with a skilled class of workers who understand RPA software. RPA can do more than just copy and paste. It is more effective and can perform more tasks with integrated machine learning. (Fluss 2019.)

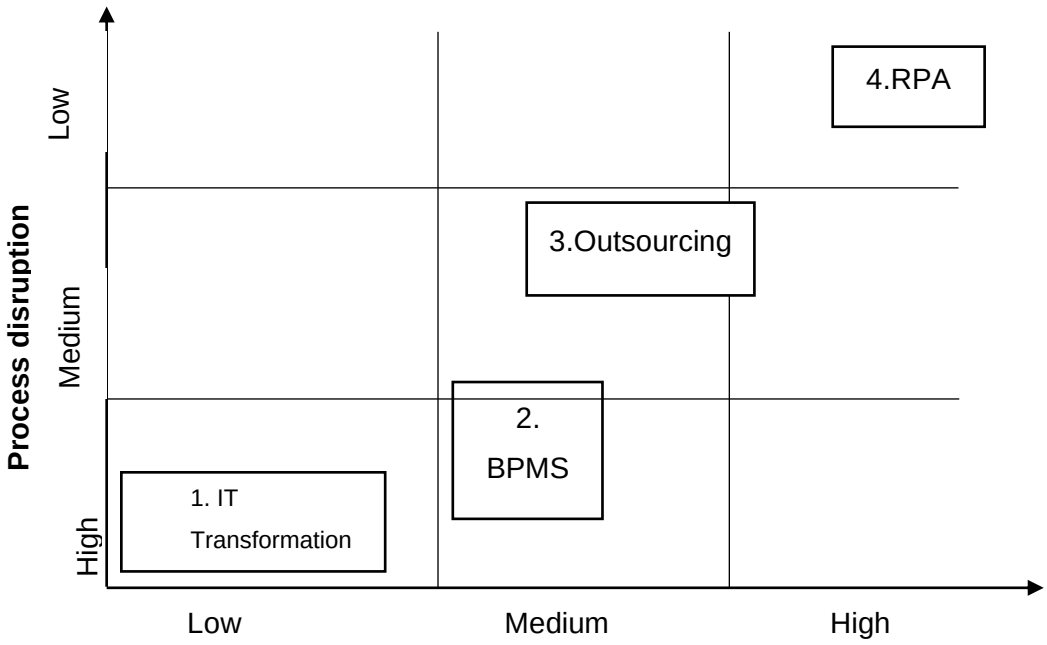

Figure 2 - RPA traditional process transformation (adapted from Deloitte 2017)

As Figure 2 illustrates RPA is high in the speed and predictability of execution. The use of RPA tools can benefit businesses and improve the efficiency of processes and the effectiveness of services. RPA is less time-consuming and speeds up the accounting processes. In the last decade, RPA tools have evolved quietly, but they have now matured to the point that process automation can be achieved at a significant scale. Software robots can perform entire end-to-end processes with very little human involvement, typically managing exceptions. Robotic process automation software robots are not limited to one business function or industry: any repetitive process that is organized, standardized and follows consistent rules, and which is overseen entirely by a human agent is often a good candidate. (Deloitte 2017.)

Robotic Process Automation is not Artificial Intelligence. It is rule-based. However, the combination of Artificial Intelligence and Robotic Process Automation unlocks strong possibilities for enterprises around the globe. Robotic Process Automation is considered a high-ranking technology in financial accounting and auditing, as they involve repetitive activities, interact with multiple systems, contain significant transactions, and require quick decisions. The main use of RPA is to make repetitive task easier with automation. By using RPA, repetitive tasks can be performed by employees in areas such as invoicing or transactions processing, filling in different types of documents, online or offline worksheets, reporting, creating, and adding databases, data verification or validation,

database sequences, and data reconciliation. Software running on RPA can either run on a physical machine or on a virtual machine, in sync with all the systems inherited from the client, including ERP, Citrix, Java, mainframe applications, or other types of applications. The use of robotic process automation in the accounting field presents an opportunity to improve the services provided. However, several concerns have been raised that the use of robotic process automation will lead to the replacement of people by robots. According to Cooper et al. (2019), the change in the role of accounting professionals can be experienced because of automation, and the professionals will have to allocate more time for analysis and forecasting activities. (Lacurezeanu, Tiron-Tudor & Bresfelean 2020.)

2.3 Artificial Intelligence

Artificial intelligence is the ability of a computer to achieve tasks that are like those of humans, such as reasoning, learning, self-correction, planning (European Parliament 2021). With AI, robotics can be developed with human-like characteristics, actions, abilities to learn from experience, and cognition capabilities to make predictions as well as determine the meaning of any situation (Swathi, Babu & Ayyavaraiah 2019, 129).

Artificial intelligence has been in the spotlight recently, but its history dates back decades. Stanford researcher, John McCarthy, coined the term artificial intelligence in the 1950s. The field of artificial intelligence has been around for more than 50 years, but advancements in computing power, the availability of the excessive amount of data, and new algorithms have led to major AI development in recent years. Artificial intelligence is seen as central to society's transformation in the digital age. We may not have realized some applications that are AI-powered, such as Online shopping and advertising, web search, Machine translations, cars, face recognition, and Siri. (Ruuse 2021.) Artificial Intelligence has been very advanced. EY 2020 Global Tax and Transformation Survey revealed that tax workers spend almost 70% of their time on tasks that AI could easily accomplish in far less time. To combat these types of problems, AI and RPA are widely used within businesses. (Kaczorowski 2021.)

2.4 Subfields of Artificial Intelligence

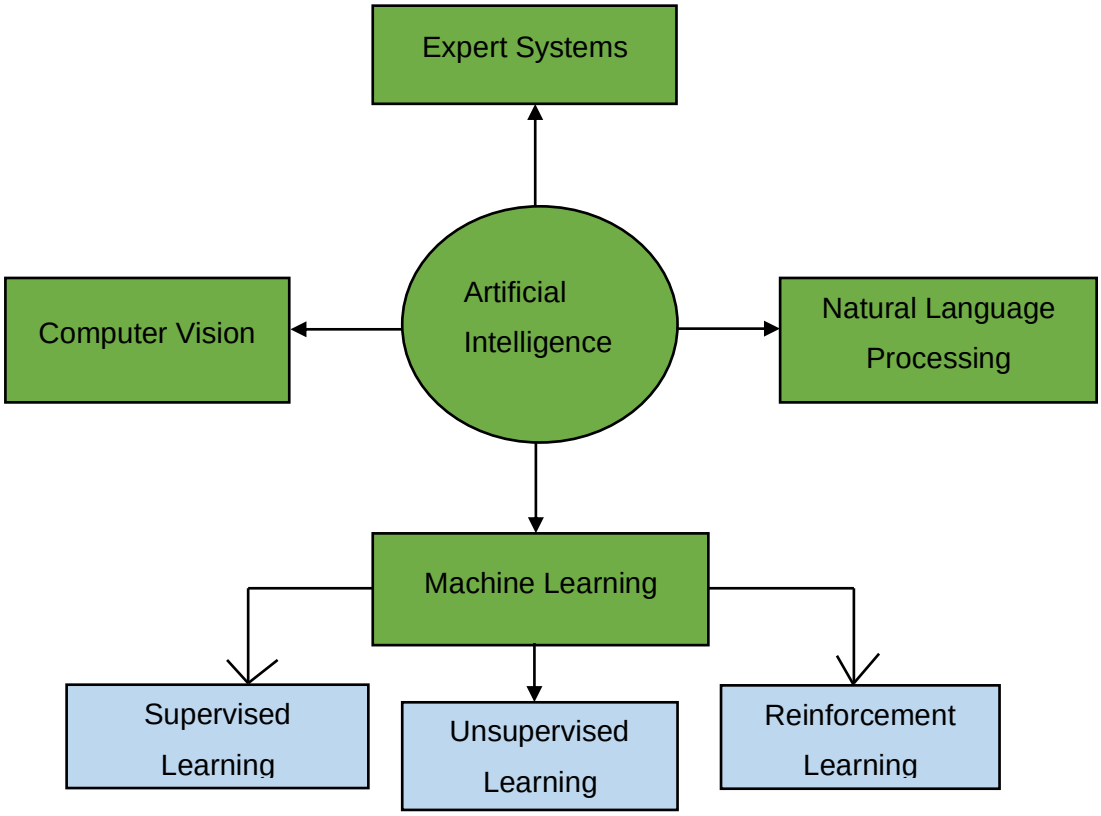

Figure 3 - Subfields of AI (adapted from Takyar 2018)

As Figure 3 shows a field of Artificial Intelligence has several sub-fields within its domain, each distinguished from the other by various techniques. The following are the main subfields in which we are progressing nowadays, and few have been used in accounting.

2.4.1 Machine Learning

Machine learning is a subset of AI which enables the computer to act and make data-driven decisions to carry out a specific task. Machine Learning came into existence in the late 80s and the early 90s. A machine learning demonstration often involves presenting a computer with new data or situations unrelated to what it has previously learned and having the computer predict the most successful outcome or goal based on what it has learned. There are three significant categories of Machine learning: supervised learning, unsupervised learning, and reinforcement learning. (Nwanganga & Chapple 2020, 3.)

1. **Supervised Learning:** In machine learning algorithms, the most common type is supervised learning. The aim of these techniques is to use an existing dataset to generate a model that then helps us make predictions about the future. As an example, we provide a supervised machine learning algorithm with training data as input. The algorithm then uses that data to construct a model as its output. (Nwanganga & Chapple 2020, 8.)

2. **Unsupervised Learning:** Unlike supervised learning, unsupervised learning works quite differently; it creates models from the unlabelled training dataset. In turn, this changes the types of datasets and the models that they can analyse and produce. Unsupervised techniques allow the discovery of hidden patterns in the given data. (Nwanganga & Chapple 2020, 12.)

3. **Reinforcement Learning:** Reinforcement learning helps to make decisions sequentially. It is about taking practical action to maximise reward in a certain situation. Various machines and software employ it to identify the appropriate response or path based on certain circumstances. Reinforcement learning is different from supervised learning since in reinforcement learning, there is no answer in the data, but the agent decides what to do to perform the task at hand. (Bhatt 2018.)

Machine learning techniques have been used in various fields, such as health, education, biology, and finance. There is a general and a domain knowledge component to machine learning. General knowledge is not dependent on data or tasks but is related to the basis of machine learning such as computer science, statistics, or neural science. Alternatively, domain knowledge focuses on a specific subject matter, such as engineering, finance, health, or chemistry. In machine learning, domain knowledge plays a key role because it helps design better datasets. (Ucoglu 2020.)

One of the most fundamental ways in which machine learning impacts the financial industry is by reducing human errors. Machine Learning currently replaces most data-entry practices, the management of invoices, and the low-level bookkeeping functions. In turn, this has reduced the chance of inaccurate accounting information being put into the system and reduced accountant workload. Financial sectors are gaining enormous value

from Machine Learning as now professionals have more time to focus on business strategy and improvement of existing business operations. (Elmes et al 2020.)

Many mechanical and repetitive tasks in accounting and auditing, which makes machine learning applications beneficial. In the field of financial accounting, regular accounting processes such as automating monthly or quarterly closing process, internal performance reporting, accounts payable, accounts receivable, general ledger accounting, cash management, inventory accounting, payroll, tax accounting, expense report have automated by machine learning. The big four accounting and advisory service providers have developed several platforms or tools that use machine learning and artificial intelligence algorithms. PwC uses several applications, but to mention one is Halo, a data auditing technology that analyses enormous volumes of data and provides an improved risk assessment. Deloitte has been using the Argus application that uses advanced machine learning techniques to identify and extract key financial information from electronic documents. (Ucoglu 2020.)

2.4.2 Natural Language Processing

Natural language processing refers to the artificial intelligence method of communicating with an intelligent system using the natural language. It is a complex task teaching machines to understand how humans communicate. Artificial Intelligence's most progressed subfield is natural language processing. Applications based on natural language processing are everywhere, starting from home assistants like Amazon Echo or Alexa, chatbots, google translate and so on. Furthermore, many languages other than English can now be captured by NLP models, allowing for near-perfect machine translation algorithms on different platforms. Natural language processing tools, techniques, and APIs (Application Programming Interfaces) are now pervasive in a wide range of industries, including finance. (IBM Cloud Education 2020.)

In risk assessments, NLP procedure uses numerous data points to appraise credit risk. For example, NLP can be used to measure entrepreneurial mindsets and attitudes in business loans. In the same manner, it can also point out any incoherent data and investigate it further. In the accounting and auditing process, companies like Deloitte, Ernst & Young, and PwC have applied the NLP system to contract document reviews and long-term procurement agreements in auditing, especially with government data. (Lyubomyr 2021.)

After decades of dealing with endless daily transactions and invoice-like documents, companies now realise how meaningful natural language processing is to gain a significant advantage in the audit process. With the help of natural language processing, financial professionals can quickly identify, focus, and visualise irregularities in daily transactions. A natural language processing program can assist with detecting significant risks, like money laundering and possible fraud. As a result, it helps to increase value-generating activities to spread them throughout the organisation. (Lyubomyr 2021.)

Natural language processing is used in various parts of accounting. Larger companies such as Deloitte are using NLP to review a high volume of contracts. The analysis of non-standardized accounts payable and receivable data during mergers and acquisitions can assist in identifying procurement synergies. It is a very time-consuming process and a lot of effort that manually creates spreadsheets and pivot tables. NLP can do it quicker and with less human involvement in recent days. The use of NLP is mainly in the review of extensive data, and its use is not very common in accounting industries. The more prominent companies are now thinking of utilising NLP in different accounting work processes, which is still undefined. (Zhou 2017.)

2.4.3 Expert Systems

Expert systems are software programs created to clear up problems and give decision-making capability like a human expert (Java t point 2021). One of the most successful and applicable artificial intelligence systems is the expert system, which helps represent the natural growth of accounting information. It is also defined as one of the developed applications that support accomplishing effective control over the accounting information by enlarging the system's general auditing controls. (Yang & Vasarhelyi 2021.)

By contrast with artificial intelligence, Expert systems do not attempt to develop fundamental postulates and build intelligence from them but instead accept human knowledge as their basis and try to formulate an aggregate behaviour. These expert systems are specialised in giving advice, analysis, categorisation, communication, consultation, design, prognosis, simplification, prediction, arrangement, knowledge, management, control, planning, instructing, and testing. (El-Dalabeeh & Aizughoul 2019.)

An expert system has three basic components: a knowledge base, an inference engine, and a user interface. Together, these components facilitate the transfer of declarative and procedural knowledge to the user. The knowledge base contains facts and rules, and

declarative knowledge is necessary for analysing problems and solving them. The elements of knowledge are facts, objects, attributes, and conditions. The knowledge base is searched and operates according to predefined rules of logic during inference. In most cases, knowledge collected in the knowledge base is transferred from human experts through appropriate methods. In addition to the knowledge base, the inference engine is the main component of the expert system. Every time a user submits a query, the inference engine is called upon to draw inferences from the supplied information and knowledge contained in the knowledge base. Therefore, logical rules are applied to the knowledge to conclude new knowledge. And the final component is the user interface. The interface needs to be present to accomplish the successful transfer of knowledge from the system to a user during a discussion. Communicating between the user and the system is achieved via the user interface. The software simulates a casual conversation using natural language interfaces. The engine can use information stored in the knowledge base to make conclusions about a given situation. (Raudzingana 2014.)

There are several categories under which expert systems are applied in accounting. Some of them are as follows:

1. **Auditing:** Expert systems, which integrate the knowledge of a single expert or multiple experts, can substantially improve the quality of auditing services, including planning, evaluating internal controls, and identifying audit risks. Internal auditors use expert systems to screen and verify transactions likely to be fraudulent. In addition, the expert system covers authorisation and claims processing. (El-Dalabeeh & Aizughoul 2019.)

   There are two forms of systems in the audit knowledge domain: The first one involves supporting the audit process itself, such as audit planning and analytical review, and internal control evaluations. The second is supporting estimates to be made by enterprises and being reviewed by auditors like wrong debt estimation, loan loss estimation or even in tax with tax accrual verification. (Yang & Vasarhelyi 2021.)

   Auditing has been the focus of expert systems research. In recent years, work was expanded into taxation, management accounting, personal financial planning, and financial accounting. (El-Dalabeeh & Aizughoul 2019.)

2. **Taxation:** Aside from McCarthy's TAXMAN, various expert systems are used in the tax field. The taxman system provides several techniques that should be useful in automating the more ordinary aspects of legal research and analysis. The TAXMAN can perform legal reasoning and is able to give a description of the facts. (McCarty 1977.)

   To assist those involved in tax, expert systems guide corporate tax accrual, planning, value-added tax, and tax preparation systems. Expert systems are available in international taxation to optimise international corporation tax positions. (Yang & Vasarhelyi 2021.)

2.4.4 Computer Vision

A computer vision program is software and a particular branch of artificial intelligence with the goal of defining what it is to see. Computer vision focuses mainly on the automatic extraction, analysis, and interpretation of helpful information from images. In the controlling processes, computer vision is useful for things such as autonomous vehicles, and for detecting events, they are used for tracking movement and authentication. (Muir 2019.)

Computer vision is a quite vast field of Artificial Intelligence. It is based on Optical Character Recognition (OCR). In simple terms, OCR works through character recognition which can be completed with an OCR engine like Tesseract and a programming language such as Python. OCR management facilitates accountants´ and auditors´ ability to manage expense reports and budgets by providing them with every document in one place. Therefore, their time can be used in more valuable tasks such as analysing reports and making sure that they are precise and safe against tax errors or liabilities. (Garcia 2020.)

The trend in Financial Services is certainly toward automating more and more business processes to improve efficiency. Machine learning, also a branch of artificial intelligence, is used in Auditing. Ernst and Young (EY) has already started using AI technology. As part of digitising the audit process, EY launched an AI proof of concept using computer vision to authorise airborne drones to monitor inventory during the auditing process. Drones can, for instance, count vehicles in a production plant under audit and communicate the data directly into the EY global audit digital platform. (Wong 2020.)

2.5 Accounting competencies

The emerging technology is changing the work of an accountant. Advanced technology has entirely changed the way accountants worked a few decades back. Accounting competencies are the skills and knowledge needed to perform specific tasks or duties. Finance and accounting professionals must possess excellent analytical and interpersonal skills and a profound understanding of industry technology. Accounting skills include a strong knowledge of accounting regulations and recording accounting transactions. Financial professionals bear a lot of responsibility since they manage the money of an organisation's most valuable assets. (Doyle 2021 & Shinde 2020.) As the technology is getting advanced and some of the works of an accountant are automated, such as bookkeeping, accounting professions must be prepared for several changes in the coming years. While these changes may be disruptive, they also open the door for many opportunities. The AACSB 2018 accounting accreditation standard A5 expects the development of information technologies in accounting graduate programs. (Kroon, Alves & Martins 2021, 3.)

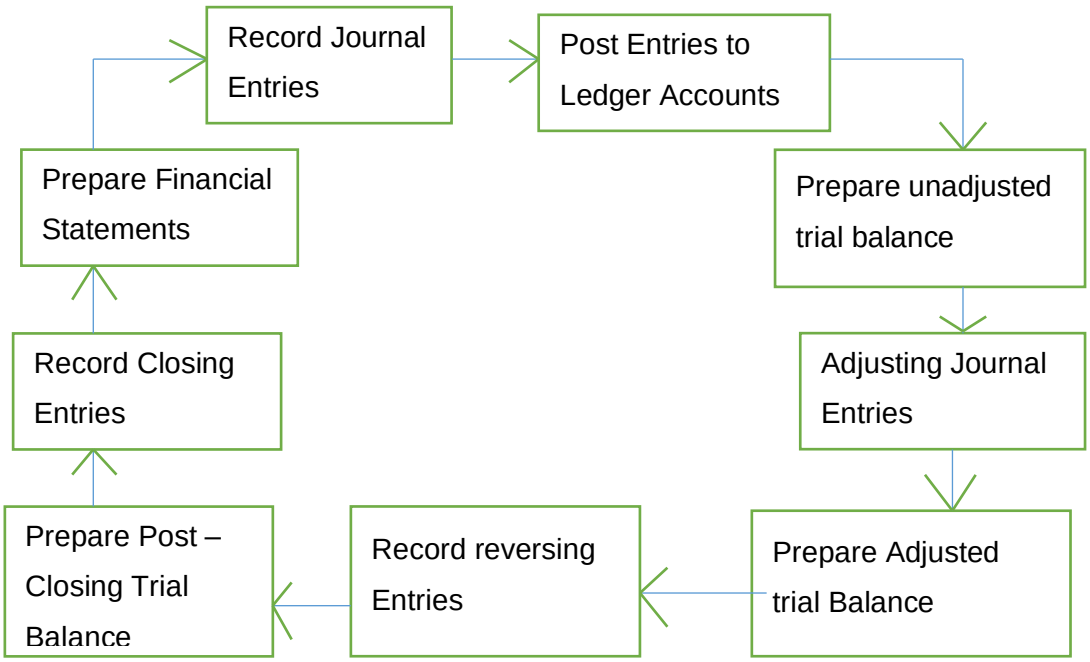

Figure 4 - Accounting Cycle Process (Adapted from My Accounting Course 2021)

As Figure 4 displays, there are nine traditional accounting cycles. An accounting cycle records a company's transaction from beginning to end, helping it remain organised and efficient. The core aim of this cycle is to make sure all the finances during the accounting period are correctly recorded and reflected in the financial statements. When a business

begins an accounting cycle, it identifies and gathers details about the transactions that have taken place during the accounting period. The transaction consists of expenses and assets acquired, borrowings, debt payments and sales revenues. Following the next process is recording financial transactions as journal entries. A transaction recorded in a journal is also posted to the general ledger. In accounting, the general ledger serves as a record of all transactions, maintaining as a master record of all transactions. Earlier steps of the accounting cycle occur during the accounting period. Still, the unadjusted trial balance is calculated after the accounting period ends, and all transactions have been identified, recorded, and posted. Trial balances display the unadjusted balances of each account. Each process is followed one by one. To complete these accounting work processes, humans' involvement is needed; however, due to the advanced technology, most of these processes are automated with AI, making it easier and faster. (Vishal 2021.)

Many industries have been drastically impacted by technology, and the accounting profession is one of them. Several emerging technologies, such as automation, cloud-based apps, and SaaS solutions, will persist in impacting the job in the future. For accountants to remain relevant and meet their client's changing needs, they must embrace these rapid advances in technology. Due to the emerging technology number of jobs may become unnecessary; however, according to the future of jobs report 2020 and by World Economic Forum, 97 million new jobs may appear by 2022. Accounting professionals should thus acknowledge that the finance functions are changing and make sure that they adapt and react positively to the changes. New technologies such as artificial intelligence (AI) have automated complex and repetitive tasks. Thus, administrative tasks, which involve human intervention, do not require human interpretation. (Deloitte 2021a.)

Artificial Intelligence and Robotic Process Automation can automate many repetitive tasks of an accountant. Employers and workers need to learn the digital and soft skills required to work with AI and RPA. However, In the EU, almost half of the population lacks basic digital skills, while one-third reports they have no digital skills at all. About 40% of employers are having difficulty filling job openings due to a lack of necessary skills such as use of accounting software, while 30% of graduates are working in jobs that do not require the skills they acquired at university. Nevertheless, new graduates' students and accountants need to accept and evolve with automation and AI. An accountant's new role includes taking personal responsibility for learning and career development diversifying skills. As a result of technology, traditional accounting skills are becoming obsolete, while other skills such as business planning and advisory are becoming increasingly important.

In a constantly changing environment, analytical skills will be crucial for accountants, especially the ability to understand how vendors, employees, and customers interact and how business is conducted. Additionally, accountants are also responsible for helping management and clients simultaneously and thinking beyond the traditional numbers. (Deloitte 2021b.)

The use of Robotic Process automation in accounting requires regulations that are IT-technical. Questions such as: which robots can view accounting data or the specifics for governance in the accounting field to mitigate risks arising from RPA should be clarified by an accountant. An accountant doesn't need to be an expert in automation design. However, they must have a solid basic understanding of RPA and its application potential and limits to use and work with the technology adequately. (Langmann & Kokina 2021, 8-9.)

Professionals in the field of accounting and finance believe that in the coming years RPA and AI is going to have a significant impact on their profession. It is very essential for professionals and upcoming graduates to know the basics of RPA and AI. (Botkeeper 2020.) Students looking forward to study finance and accounting should have a basic working definition of RPA, an understanding of how RPA affects the finance and accounting profession, a strong sense of how RPA software works, as well as the general steps necessary to learn more about RPA. To understand the basic of AI, accountants should have the good analytical skills and have a good understanding of statistics and modelling. The ability to understand algorithms is crucial for finding the bugs in a computer system. It is also helpful to have a basic understanding of programming. (Jiles 2020.)

3 Research Methods

In this chapter, the author, discussed the methods which were used to complete the research and why that method was chosen. The objective of the research is to find out the change in the accounting work processes because of AI and RPA and the challenges students might have to face because of the advanced technology implemented in the job market. The research question of this thesis is “How is Artificial Intelligence and Robotic Process Automation changing the work of accountants and what challenges will it bring to accounting students?” The investigative questions were further explained in chapter 1 of this thesis. There were few alternatives to carry out this research such as surveys and interviews. The research method chosen for this thesis is qualitative and chapter 3.1 will further explain why the method chosen was best suited for this thesis. Alongside, the upcoming subchapters will present the research design, development of the data collection, distribution of the questions, data analysis methods and ethical consideration.

3.1 Research Design

This research was conducted using a qualitative research methodology in the form of semi-structured interviews. Qualitative research can be explained as one that focuses on non-numerical data and is naturalistic. In other words, it aims to understand and explore rather than to explain and handle variables. Although qualitative research is naturalistic, informative, like quantitative research, it is also systematic, ensuring that the problem is identified, data is collected, analysed, explained, interpreted, and evaluated. (Patton 2015, 55-65.) The qualitative method makes use of theory in a variety of ways. Qualitative researchers study human phenomena through multiple methods, including biography, case study, historical analysis, ethnography, grounded theory, and phenomenology. In contrast, quantitative analyses focus more on the social world. It is used to observe situations or events that affect people, and the collection of results is based on numerical numbers. Qualitative research involves gathering and analysing narratives or open-ended examination through methodologies such as interviews, focus groups or ethnographies. In qualitative research, observation and interpretation of how people think and feel are used to understand better their behaviour, experiences, attitudes, intentions, and motivations. (Ahmad, Irfan, Wasim & Gogoi 2019.) The qualitative method was best suited in this research because it focuses on people’s experiences. It does not depend on large numerical numbers; instead, it is based on data that cannot be measured or counted but can be collected and interpreted through observation. And this research focuses on why and how questions, making it more reasonable to stick with only qualitative methods.

As presented in the research design in figure 4, the research is comprised of one qualitative phase. Expert interview questions were chosen to be the data collection method, and the collected answers were analysed using a qualitative approach. The respondents were professionals from Finland and accounting students from Finland, New Zealand, and Nepal. The author of this thesis wanted to have the opinion of international students on how well their universities are preparing them to work in the field of accounting.

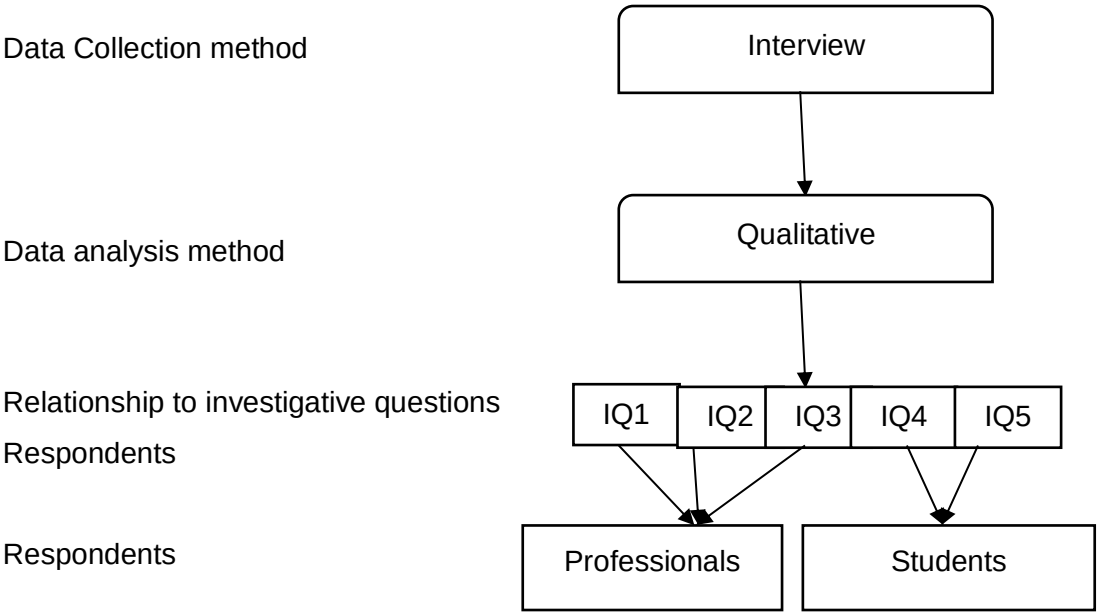

Figure 5 - Research Design

3.2 Design of Data Collection

A semi-structured interview was conducted to collect primary data for this research. In a semi-structured interview, the researcher designs the outline of the topics to be discussed, but the interviewee's responses determine how the interview is conducted. A discussion of this type is one of the most used types in qualitative research. In a semi-structured interview, interviewers can ask open-ended questions to receive more valuable answers. When conducting a semi-structured interview, the interviewer is not required to follow a predetermined list of questions strictly. The interviewer asked open-ended questions, which allowed for a more in-depth discussion with the interviewee. To prepare for semi-

structured interviews, researchers often conduct observation and informal interviewing to gain valuable insight into the topic of interest, which is necessary to develop relevant and meaningful questions. There have been various ways to categorise qualitative interviews, with many contemporary texts dividing them loosely into unstructured, semi-structured, and structured categories. A semi-structured interview was best suited for this research because the respondents' answers are not limited to questions prepared. (Stuckey 2013, DiCicco-Bloom & Crabtree 2006.)

Table 2 below displays the background questions for professionals and background questions for students. Background questions were asked at the very beginning of the interview to learn more about their information. According to their background information, open-ended questions were asked.

Table 2 - Investigative questions in relation to background questions.

Background Question	**Interview Questions**
Background Questions (for Professionals)	1) What is your job title? What are your main duties in accounting/RPA/AI? 2) How many years of experience do you have in the accounting profession or in AI profession or in RPA?
Background Questions (for Students)	1) What is your name? What is your profession? 2) Where do you study? What is your university name? 3) What are you specialising in?

Table 3 below shows the first investigative question for professionals as well as its relationship to interview questions. This Investigative question was explicitly focused on AI and RPA experts and was asked by the interviewer. These specific interview questions were asked to professionals to clarify the need to adopt advanced technology in accounting and finance.

Table 3 - Investigative question 1 in relation to interview question.

Investigative Question	**Interview Questions**

IQ1. Why are businesses adopting AI and RPA technology in the field of accounting and finance?	3) Why are businesses adopting AI and RPA technology in the field of accounting? 4) What applications have you used that include AI in the background or as the main process? 5) What are the main usages of AI/RPA in the field of accounting?

The table 4 below presents the relationship between the second investigative question and interview questions. The interviewer asked these investigative questions and interview questions to professionals.

Table 4 - Investigative question 2 in relation to interview question.

Investigative Question	**Interview Question**
IQ2. How is AI and RPA influencing the accounting work processes?	8) AI/RPA changes the way people work and it may cause uncertainty about jobs. What kind of concerns have you seen, or do you expect among students of Finance and accounting? 9) If we think about AI/RPA competencies of new accounting graduates, how well do you feel they are qualified to start working in accounting and Finance? What skills do you feel they are missing? Do you think they already have a few skills?

Table 5 below presents the third investigative question prepared for professionals and its relation to interview questions.

Table 5 - Investigate question 3 in relation to the interview question.

Investigative Question	**Interview Questions**
IQ3. What do accounting professionals consider to be the key AI and RPA competencies for new graduates?	6) some accounting work such as AR, AP, and expense reports can be automated with machine learning- How

	do you think this affects the knowledge and competencies required of new accounting graduates? 7) In the field of accounting consultancy, advising, analysing, controlling, and planning expert systems are used. How do you think this changed the work of accountants? How has it affected the work already?

Table 6 below presents the fourth and fifth investigative questions for students and their relation to interview questions. Investigative questions four and five were designed for accounting students, and the interview questions in the table above were designed separately only for students.

Table 6 - Investigative questions 4 and 5 relations to interview question.

Investigative question	**Interview questions**
IQ4. How well are students prepared for accounting jobs?	4) How prepared are you to start your career in accounting? 5) Regarding skills requirements based on technology, how difficult was it to find an internship? (Finland) How difficult will it be to find an entry-level job in terms of skills requirements based on technology? After graduating from university. (International students)

IQ5. What knowledge have students acquired in AI and RPA at university?	6) How well do you know terms AI and RPA? 7) Do you think your university provides you with the required number of courses for IT skills? 8) How have you used AI applications in your studies? Do you think AI courses should be offered in universities? How would have it helped you? 9) Advanced technology is changing the work of an accountant. What challenges do you think this will bring to students?

3.3 Data Collection and saturation

The companies were searched through google and were contacted through phone calls and the LinkedIn business platform. A total of 30 companies were contacted. Besides companies, several individuals with knowledge of accounting and AI were contacted through LinkedIn and phone calls, however. They were not from an accounting advisory company. Some contacts were provided by interviewees as well. Additionally, few AI start-up companies were contacted. The interviews were conducted in the month of October.

Since this research has two respondents, professionals, and students, different UAS and university students majoring in financial accounting were contacted. Students were contacted through WhatsApp, LinkedIn, and direct calls. To make the data collection method more valuable international students from abroad were also contacted through Instagram and email. The author chose New Zealand and Nepal because the author has studied in both countries and knows these two countries' education systems. The research is more valuable because the author can compare students' studies experiences. The author has experienced these countries' education systems and knows how advanced the universities are in implementing technology-based education. It was also possible for the author to interview students within Europe; however, without experiencing the education system of those specific countries author did not feel the confidence to act on it.

Table 7 - The interview process of professionals.

Company 1	AI Professional	Microsoft teams 35Minutes	Recorded and transcribed
Company 2	AI Specialist	Microsoft teams 30 Minutes	Recorded and transcribed
Company 3	RPA Professional	Microsoft teams 30 Minutes	Recorded and transcribed
Company 4	Process Development, accountant, RPA expert	Microsoft teams 40 Minutes	Recorded and transcribed
Company 5	Process Owner	Microsoft teams 30 Minutes	Recorded and transcribed
Company 6	Leader in RPA and Intelligent Automation	Microsoft teams 35minutes	Recorded

Table 7 above illustrates who were contacted and how long the interview lasted. The questions were provided to the interviewees beforehand so that they could familiarise themselves with the topic. However, some additional questions were asked during the interview because the author felt that it was relevant for the research. In this data collection, a specific candidate was targeted who had the knowledge of accounting, Artificial Intelligence and Robotic Process automation.

Table 8 - Process of Interviewing students.

Student 1	Haaga-Helia UAS, Finland	Major: Financial Management	Face to Face, 40 Minutes
Student 2	Haaga-Helia UAS, Finland	Major: Financial Management	Microsoft teams, recorded, 25 minutes
Student 3	Haaga-Helia UAS, Finland	Major: Financial Management	Microsoft teams, 30 minutes
Student 4	Haaga-Helia UAS, Finland	Major: Financial Management	Face to Face, 40minutes

Student 5	Metropolia UAS, Finland	Major: Finance and accounting	Face to Face, 30 Minutes
Student 6	Metropolia UAS, Finland	Major: Finance and accounting	Microsoft teams, 30minutes

The table 8 above presents the students at University of Applied Sciences. Metropolia and Haaga-Helia were the only university of applied sciences chosen because they offer wide variety of Finance and accounting courses in BBA degree compared to other universities of applied sciences. Few students who were interviewed graduated this year and rest are studying and majoring in Finance and accounting.

Table 9 - Process of interviewing International Students.

Student 7	Aalto University, Finland	Major: Finance	Microsoft Teams, 30Minutes
Student 8	Aalto University, Finland	Major: Economics Minor: Finance	Face to Face, 30 Minutes
Student 9	University of Waikato, NZ	Major: Accounting	Email
Student 10	University of Waikato, NZ	Major: Accounting	Email
Student 11	University of Pokhara, Nepal	Major: Accounting	Email

Table 9 shows the interview process of university students. Two students from Finland and three students from abroad. Due to the time difference, international students were not able to participate in teams meeting. Thus, they answered through Gmail.

The qualitative methodology requires data collection until saturation is reached. The concept of saturation is essentially data sufficiency, and it refers to the process of collecting data until no new information can be obtained. In qualitative research, there are no formulas, guidelines, or tests of adequacy available to estimate the sample size necessary to reach saturation comparable to those used in quantitative research. To determine the signal of saturation, the researcher evaluates the results' adequacy and comprehensiveness. In grounded theory, the term theoretical saturation refers to the point at which no further issues or insights emerge from data and the relevant conceptual categories have been identified and explored. (Morse 1995, Glaser & Strauss 1967.) Even though saturation has its roots in grounded theory, it is also used in many other

approaches to qualitative research. The objective of qualitative research is not necessarily to collect all ideas and themes but to collect the most important ones and identify them. (Meloncon 2018.) While conducting the one-on-one interview, the interviewer reached the point where new data collection no longer changed the answer. The depth of answer was already achieved even with the smaller number of interviewees. Therefore, the interview was stopped after six interviews with professionals and Eleven interviews with students.

3.4 Data Analysis

Qualitative research encompasses many philosophical underpinnings and methodological approaches. Each approach has its own way of approaching all stages, including analysis. There are several types of qualitative data analysis, each serving a different purpose. However, the very suitable method used here is thematic analysis. The thematic analysis is a method of analysing the qualitative data and is typically used to collect texts, such as interview transcripts. Researchers examine the data closely to discover common themes- topics, ideas, and patterns of meaning that are repeated over and over. Braun and Clarke (2006) developed the thematic analysis process for psychology research. Nevertheless, it is a very flexible method that can be used for a variety of research. There are different approaches to thematic analysis, but a deductive approach is used for this thematic analysis. A deductive approach involves coming to data with some preconceived themes researcher expects to see reflected there, based on existing knowledge or theory. (Seers 2012, Caulfield 2019.)

Thematic analysis has six steps developed by Braun and Clarke (2006). Since the researcher in this thesis has used semi-structured interviews, the steps below will explain the analysis of the collected data.

Step 1: Familiarization

In the process of familiarisation, the researcher listened to all the recordings. After listening to the recording, the researcher went through the transcription and made the notes.

Step 2: Coding

Coding is the process of highlighting specific sections of our text- usually phrases or sentences and describing them in shorthand (Caulfield 2019). To show an example of how the data was analysed, very small parts of IQ1 Why are businesses adopting the AI

and RPA technology in the field of accounting and finance? Is shown in the table 10 below.

Table 10 – Demonstration of the coding process.

Transcription of interview	**Codes**
"By adopting the AI and RPA employees can focus on tasks that requires criticial thinking and problem-solving skills, company can benefit in several ways to mention few is cost effectiveness, efficiency, reduce human errors" (Person X 2021). "To compete in the market, to make the accounting process faster and easier. The reason for adopting the AI and RPA is basically to cut down the cost, remove human errors, improve efficiency and productivity" (Person Y 2021).	Humans are needed in more advance work. Reduction of error and improved efficiency. Convenient Saving, accuracy and productivity

Step 3: Theme generation

In step 2 the table 10 above shows one example of how all the interviews were transformed into the coding. Going through each interview, making notes, and highlighting the most important sentences was very time-consuming. Nevertheless, it is an excellent way of analysing the collected data. In this step, the codes are combined into a theme.

Table 11 - Conversion of codes into themes

Codes	**Theme**
▪ Humans are needed in more advance work ▪ Reduction of error and improved efficiency ▪ Convenient ▪ Saving, accuracy and productivity	Proficient Accuracy

Step 4: Review of themes

In reviewing themes, there was no need to change the theme because these themes were presented in the data. It was challenging to show each recording process with each IQs because it was a lot of struggling to do on the computer. Using the transcription of recording and listening to the recording simultaneously, the coding and theme were written with pen and paper.

Step 5: Naming and defining themes

After going through each recording, the themes' names were changed according to the collection of data, and the themes were replaced with proper names.

Step 6: Writing up

The results section was written after all the above-mentioned processes.

3.5 Ethical considerations

In all research studies, considerations of ethical principles are crucial for protecting human subjects. Especially in qualitative research, ethical consideration is more important due to the in-depth nature of the study process. The most important thing to understand is what is ethical and unethical, right and wrong. Anonymity and confidentiality are very crucial when it comes to interviewing companies' candidates. (Hammersley & Traianou 2012, 16-17.) Before conducting the research, the author of this thesis studied the Finnish National board's guidelines on research integrity TANK. Tank is a Finnish advisory board on research integrity. It is appointed by the Finnish ministry of education and culture. The institute's purpose is to promote the responsible conduct of research so that research misconduct does not occur, spread information about research integrity in Finland, and monitor international developments in research integrity. (Tenk 2012, 2.) Therefore, the data collected from interviewees are not false data and not the work of others.

In this semi-structured interview, anonymity was important because interviewees were working in a company and were afraid of publishing its name. From an interviewer´s perspective, it was also essential to make interviewees feel safe in responding to the answer. The interviewer identified herself in the email, proved to the respondents that it is bachelor thesis research for the Haaga-Helia degree program, and respected the interviewees' decision to stay anonymous. Before conducting interviews, the interviewer explained the objective of the thesis and why it was interesting for her.

4 Results

This chapter presents the results of the interview conducted between the 1st of October and 31st of October 2021. The results are divided into subchapters, and each subchapter is broken down based on investigative questions. Subchapter 4.1 presents the importance of investigative questions and how each investigative question helped the author find the results. The rest of the results in subchapters 4.1.1 to 4.1.5 are presented according to the overlay matrix from chapter 1, which ensures that all the investigative questions are answered with the collected interview data.

4.1 Introductory questions

To start the interview interviewees were asked preliminary questions. The interviewees in this research are divided into two categories: professionals and students. There were six professionals and eleven students who participated in this research process.

Professionals are from Finland. They all have experience in a different field. Some of the professionals are AI specialists and RPA specialists, and they were asked about their accounting knowledge, and they mentioned that they have a good understanding of accounting. The professionals were asked about their work experience, primary responsibility, and interest in accounting. Some of them have more than five years of experience, and some have almost 10years of experience in their work field. The AI specialist mentioned that their responsibility is the AI development system, such as planning and execution of it. As mentioned, the Process development consultant is responsible for using different tools and technologies such as RPA and AI and is also involved in ERP system development. Apart from technologies, they are also involved in working with people and how things are done and developing the ways of working.

As mentioned, the interviewee, RPA consultant is responsible for helping clients design, develop, test, and implement process automation using RPA software in accounting. The interviewee, process owner responsibility as mentioned is doing processing, and when the processes are ready, they also do the auditing for the accountants. When the procedures are ready, they put the automation together. The RPA and intelligent automation Leader mentioned their main responsibility is to manage their competent automation services and coordinate the team with different automation processes.

4.2 Investigative questions

This chapter answers the investigative part of the study.

4.2.1 Why are businesses adopting AI and RPA technology in the field of accounting?

The first investigative question aims to discover the adoption of Artificial Intelligence and Robotic Process Automation in accounting and finance. This investigative question also presents the results of AI and RPA in accounting and what applications or methods they have used as the primary process. The data collection process in chapter 3.2 shows which interview questions were divided to each IQs.

The majority of interviewed companies mentioned that a lot of work in the field of accounting used to be done manually until recently. Manipulation of big data used to be quite challenging and would consume a lot of time and energy. However, now the same work is said to be done within minutes with the help of AI and RPA. For example, a fair amount of AI assistance is involved in bookkeeping.

The respondents were six professionals from different companies in Finland, and each of them was asked the same question. According to an AI professional from **company one**, businesses are embracing AI and RPA in accounting because technology is getting more advanced. Adoption is a good way to improve efficiency. With the adoption of AI and RPA, employees do not have to spend hours performing manual tasks, and they can devote more time to the areas they think are essential, so they can make the best use of their time. In addition, AI professionals mentioned that companies would have to adapt to the change sooner or later, which is also one reason why they are starting to incorporate AI into their systems. When the professional was asked about the main usages of AI in accounting and what AI and RPA application they have used. It was said, the main usages of AI and RPA in accounting is money laundering, bookkeeping tasks such as categorising expenses, payroll, bill pay, invoicing, analysing big data are few to mention. However, it was also added that it would be more than this in the coming future. It believes that large international enterprises have already used AI in many accounting paths. Company 1 uses unsupervised Learning methods in their business.

The AI specialist from **Company two** answered that there are many reasons why businesses are adopting AI and RPA in accounting. The excellent reason is that they can provide fast and convenient services to their customers with automation. The AI specialist

stated that any company could make good profits through AI and RPA as they require fewer human resources and result in fewer errors. AI specialist was asked whether AI makes their work easier and if it is helping their company. The answer was that the use of AI is helping the company from facing less difficulty with the error made in the huge data collecting process. Especially when working with big data analysing/collecting processes, there is a high risk of making mistakes. So, it has been much easier. The AI specialist also added that “there are different dimensions needed for each invoice line, and AI covers all this”. Additionally, their customers are pleased with the quality of work they are providing to them.

When the specialist was asked about the usages of AI in accounting, it was mentioned that it depends on the work that is possible to automate using AI. Not every company has applied AI in their work processes, and not all accounting work processes are worth automating; that is why the usages of AI in accounting are limited for now. It was also added: However, shortly, half of the work of an accountant can be automated with the involvement of AI. In Addition, the interviewer asked if the company was using AI or RPA application as the primary process. Company 2 uses Artificial Machine learning, a subfield of AI, and it is also presented in theory. The interviewee said that they are using python coding for AI. Various programming languages can be used to develop AI applications, such as Lisp, Prolog, C++, Java, and Python. Among them, python is one of the most popular programming languages. The reasons are that python requires significantly less coding and has a simple syntax among other programming languages, which is best to use for developing AI applications. Python is very easy to learn. It has very few keywords and a simple structure. Also, it is easy to read. (Tutorials point 2016.) The interviewee mentioned that Python is straightforward to read and teach others.

The RPA professional from **company three** answered that businesses should adopt AI and RPA in finance because employees are wasting their valuable time on the basic task that can be automated with RPA. As company 3 is an RPA specialist, the answer given was also based on the knowledge of RPA. The RPA professional believed that adopting RPA helps employees focus on other accounting tasks that are better fitting and more valuable for human workers. During the interviews, the interviewer asked what valuable tasks meant. It was responded that valuable tasks are something like a more human-to-human interaction and simply interacting with customers in a financial context. It was said that companies could use intelligent human beings in the areas where they can utilise their talent. This way, businesses can provide valuable services to their client. It was also added that; “RPA can be issued in all the different subcategories under the financial

services; however, no task or area of financial services can be completely automated, but you can automate to some extent, and humans are always needed to work on it". In conclusion, it was said that businesses adopt RPA because it saves a lot of time, less error, and quality services to a client.

During the interview, questions were not just limited to what was prepared, but more open questions were asked. Since people often misunderstand AI and RPA terms and the conversation was becoming more interesting, the interviewer asked the main differences between AI and RPA. And the answer was that "RPA is a productivity tool, it is used to automate relatively quickly and simply the routine interaction with the computer, there are real hardcore IT people doing coding line by line and really getting into the system and interaction, while the real core of RPA is just to outsource the clicking and typing that the human would normally do in front of a computer". Additionally, pure robotic process automation is rule-based computer interaction. And, "while RPA is software that can be applied to a wide variety of different industries, the main usages of RPA in accounting are for example: write down the account event, the complexity and the whole process, of course, is complicated you have different people involved, you have the accountant, vendor sending a bill, different shareholders and so on but what actually happens in the computer is from the given pdf you need to see sum and write that sum into some system. It is all about clicking and typing. The scope of the whole process happens completely within the computer with well-defined rules".

The Process Development consultant with previous experience in RPA and accounting from **company four** answered that businesses adopt AI and RPA technology in accounting because it is very cost-efficient, less risk has quality assurance and is very timesaving. When asked what AI application their company uses as the main process, it was answered that the company has in-house artificial intelligence development to apply to their own ERP system. So far, the company have used AI on handling Accounts Payable processes in the different business unit. The main usages of AI in accounting could be producing repetitive journal entries, handling some supplier or customer registers, and producing monthly reporting material. It was interesting to hear that the processes mentioned above are possible to automate with AI and make it clear to readers the difference between RPA and AI and what AI can accomplish that RPA cannot. The open question was asked: How can you **differentiate AI and RPA?** The main difference is that RPA does what it has been taught to so, it follows the rules and does according to the training. Artificial Intelligence can constantly learn from its actions, so it never repeats the same mistakes. RPA does not have the ability to evaluate its work. Since the company

have an in-house AI department, they have teaching material for AI based on the materials it is taught to handle different cases. When it comes across the different cases, then the company can follow what kind of decisions or suggestions AI has made. Taking an Accounts Payable process as an example, where they post invoices such as bookkeeping account and other dimensions for posting, they can see what went wrong when they review AI suggestions, and they can also feed AI with the feedback data so that it can learn and avoid mistakes in the future.

The process owner from **company five** answer was very similar to company 4**.** It was said that modern technology is getting very advanced. The reason for businesses to adopt AI is that a lot of manual work is time-consuming and boring. Humans can do multitask where they are more appreciated, and the adoption of AI will free humans from boring manual tasks. It helps the company to save costs, and employees can give their time to more valuable work such as human to human interaction. When human intelligence starts to work in the right path inside the company, that is the sign of the company being in profit already. They are using Machine learning algorithms to post invoices, pay and do payroll, bookkeeping year closing, informing tax offices, receipts, and purchase orders. The company used the Blue Prism application before and now using UI Path for RPA. They have an outsourced IT department, so they oversee coding.

The leader in RPA and intelligent automation from **company 6** mentioned that there are various reasons for the company to adopt AI and RPA in businesses, specifically in accounting. From the Leader perspective, the larger company adopts AI for cost efficiency and smaller companies adopt AI for quality. The kind of service they provide to their customer is essential for them. They want to ensure quality in their services; that is why they adopt AI and RPA in accounting. Company 6 uses a robot framework, UI path tools, blue prism, and for AI, they use pure python hard coding. There has not been any specific AI software they have used besides the python hard coding program.

To summarise, professionals believe that businesses are adopting AI and RPA in the field of accounting and finance because in accounting and finance, a lot of work is time-consuming, and employees are needed even to complete the small work. Due to advanced technology like AI and RPA, manual work which needs human involvement are now done by AI and RPA. When humans are involved in the manual work process of accounting, an error can occur; however, with the use of AI and RPA, no errors can occur, and companies can provide quality services to clients.

4.2.2 How is AI and RPA influencing the accounting work processes?

This subchapter focuses on investigative question two. The researcher has outlined the results of an interview with a professional.

According to professionals, AI and RPA are on two opposite sides of an intelligent automation field. Automation has shifted from a process-driven to a data-driven approach. RPA is highly process-intensive, it automates rule-based tasks, but AI needs good, high-quality data to be able to learn and function correctly. They mentioned that RPA is primarily used for routine processes that do not require complex judgment or decision-making. It is most often selected for internal performance reporting, purchase-to-pay, and record-to-report. Their 50% of transactional accounting is taken by automation, as they reported. They stated some of the works of humans are already replaced by robots in the field of bookkeeping, and humans assist in multifaceted, complex tasks. The automation is benefiting many of the accounting tasks such as reporting monthly, quarterly close, internal performance reporting, accounts payable (automating approvals, maintaining, supplier/customer data, validating and posting payments, creating/processing/delivering invoices, billing, collections, matching invoices against purchase and sales orders) period-end closing, general ledger accounting, cash management, inventory accounting, payroll, tax accounting, expense report. They have been able to do good in their business because of automation.

They mentioned in the past that everything was manual. According to their experience, lots of things have been easier and timesaving because of automation in the field of accounting as well as in overall business processes. The use of AI is extensive and is used in different accounting processes. Before implementing AI in any accounting work process, they need to teach AI how things should be done, and AI can automate any part of the accounting process. They mentioned different subfields of AI, such as machine learning or expert systems that can be used in different work processes. They are progressing slowly in implementing AI in their business. They added: AI and RPA increase accuracy and efficiency. Additionally, automating repetitive, manual, tedious tasks has made accountants less volatile and more visionary.

According to them, traditional accounting responsibilities include entering accounting books, the creation of accounting vouchers, as well as the preparation of statements etc. Employees in the accounting department will have to monitor procedures. This traditional way of accounting requires a lot of workforce, financial resources, and material resources,

which means the efficiency is low. Tasks will not be accomplished on a set schedule, even if it is completed on time, employees need to work overtime, the work is less effective, and many more problems can occur. When an organisation uses accounting software to handle all financial operations, it saves time and increases the efficiency of its work. Accounting employees can input the data into a computer, and the computer does the rest of the work. Accountants may make an error when entering the necessary data. AI or RPA system can automatically report the error as an incorrect entry, which can be corrected to enhance the quality of the accounting records.

They mentioned AI and RPA is influencing the accounting work processes in many ways. They have realised in the Covid-19 pandemic the use of AI and RPA and its benefit. As everything now is a computer system, they said employees do not have to come to the office to work. Because of technology, everything is possible to do from home. They could share files and work on their laptop. Due to implementing some AI and RPA tools, many work processes have been easier and faster for them.

In conclusion, accountants need to accept the technology as it brings efficiency to work. AI and RPA influence an accountant's work process by making the work easier and faster. Accountants are able to give their valuable time in consulting with clients or in any other important area of accounting. RPA and AI are saving a lot of time, and errors are happening less. Work such as Accounts payable, receivables may not need humans in the future. However, it will create interesting work for accountants to upgrade skills according to their needs.

4.2.3 What do accounting professionals consider to be the key AI and RPA competencies for new graduates?

This subchapter focuses on investigative question three, which is about new graduates' key artificial intelligence and robotic process automation competencies.

Every professional interviewed had a very similar opinion. In their perspective, the essential thing for students is to know about automation. The basics of RPA or AI knowledge is good to have when students start their career in accounting. They mentioned that almost every financial company in Finland uses automation in the accounting processes; therefore, students will eventually have to use automation while they start working. It was stated that not every company is willing to teach students skills they are missing or knowledge they lack in something, so it is the responsibility of

educational institutions to provide technical skills needed for students to succeed in their career path. They mentioned when they mean students should know about AI or RPA; it does not mean they should be RPA experts or AI experts in addition to an accountant. They mean students should know the basics of programming or coding. They expect students to have a positive attitude towards learning and that they are willing to adapt to change. From their perspective, SAP, ERP, advanced excel are basic skills that all accounting students need to know, and if students lack these skills, it will be a big challenge for students to learn about RPA tools or AI tools as SAP or ERP can be applied in RPA and AI as well.

Professionals do not think students are missing any skills when it comes to accounting since they are accounting students, and they are going to earn a degree in that field. They also mentioned that the technology was not advanced enough to be integrated into accounting work processes previously. Consequently, companies did not set technical skills requirements for accounting jobs. But, in the modern era, technology skills are a must-have and required by many companies. It was fascinating to hear from the professionals that basic technology skills are not considered an advantage anymore, so the expectations are higher. Some familiarity with new accounting software is valued. Professionals mentioned that they do not want students to be good at just numbers but better at communication skills, analytical skills, and technology skills. After the implementation of technology in accounting, they mentioned that there would be more technical jobs arising in the field of accounting.

Professionals were asked many open-ended questions and their answers were very interesting. They stated that the university of applied sciences and universities should offer students basic courses in AI or RPA. Workshops in AI and RPA once in two weeks or once a week are one way to start enlarging the students' knowledge they mentioned. They also added that universities and UAS could collaborate with financial companies to help students gain the knowledge they require to start a career in accounting. As mentioned in the interview, few companies have been offering students lectures in AI and RPA in collaboration with universities.

One of the professionals mentioned, to be precise, students should have the basics understanding and difference between RPA, integration, machine learning and OCR because everything now is based on technology and even the phone app can do the accounting without needing to meet the clients such as sending images of receipts. When

they start a career in accounting and if they want to advance in their job skills then it is a must and good advantage to know something about AI and RPA.

According to them, recent graduates need to learn to adapt automation. Accounting cannot be completely replaced by artificial intelligence, but recent graduates should be proactive in responding to its impact. Furthermore, for new graduates to be able to effectively adapt to the change due to artificial intelligence and robotic process automation, they should acquire some abilities and skills in their studies. Professionals consider key abilities to be Computer skills, Management skills, Analytical skills, and decision-making skills.

4.2.4 How well are students prepared for accounting jobs?

This investigative question was aimed for accounting students. The answer of Haaga-Helia students will be presented first, followed by the answer of Metropolia, Aalto, and international students.

Students 1,2,3, and 4 were from Haaga-Helia University of Applied Sciences. They were asked interview questions with some open-ended questions. Student one graduated last year and during the study period in Haaga-Helia, student one felt that the knowledge acquired from the courses was fundamental and felt insecure about the knowledge acquired. The courses offered were sufficient, but the content should have been different. For example, the basics knowledge in the student opinion should have been shorter. Courses should have been structured according to what is needed in the job market and assignments could have been more practical. According to student 1, for students achieving a degree is a huge accomplishment and students believe that whatever they learn in their degree somewhat prepares them for entry-level jobs. However, in student one experience, BBA degree did not prepare for even entry-level jobs in accounting. In terms of skills requirement based on technology, it was easier for him to find internship because student was already working in a company. But in the student opinion, Haaga-Helia did not help students enough to prepare for an internship in terms of technical skills requirements. In the student experience, even the basic work needs very good IT skills for example SAP was offered in the degree program, but one course was not sufficient to upgrade the skills required in job market.

Student two graduated from Haaga-Helia UAS in spring 2021, said that he/she was prepared to start a career in financial accounting. However, technology is growing vastly,

and the requirements of accounting jobs have changed, and the basic principle of accounting is not going to prepare students to start a career in accounting. Student two indicated that, with the degree of Haaga-Helia, student was prepared for accounting jobs, but only if the technology was not required. In terms of technology required, student felt less prepared to start a career in accounting. Additionally, it was mentioned that each student has a different background. Some already have a background in accounting and plan to study to increase their knowledge so, every student has different experience while answering these questions. Student said that he/she was less prepared for accounting jobs.

Student three is currently a student in Haaga-Helia UAS. It was mentioned that student is not prepared to start a career in accounting just with the degree from Haaga-Helia UAS. There are many courses offered but they offer very basic understanding of financial accounting, there are no courses that provide useful IT skills for preparing students for careers in accounting. It was mentioned that to start a career in accounting students need to prepare themselves by researching the demand of job market. As well, finding an internship was difficult in terms of technical requirements. Nowadays, even a very basic job requires advance excel skills and from what student have acquired from the courses does not even prepare for basic excel skills.

Student four is currently a student in Haaga-Helia, and it was said the student feels very prepared to start a career in accounting. Courses provided in Haaga-Helia was also very helpful to prepare for accounting job however, previous experience in accounting also made a big difference in the student life. In terms of finding internship based on technology, the student said, “to be honest, it was difficult just from what I learned from Haaga-Helia, but I had previous experience working in the field of accounting that made me easier to find internship”. From the student perspective, the university of applied sciences is not providing valuable courses that helps to stand out in the crowd.

Students five and six are from Metropolia University of Applied Sciences, and they said that they lack the basic IT skills in accounting. From Metropolia, they have acquired good knowledge in financial accounting however, it was not sufficient, or the context of the courses were not actually helping them to start working in accounting jobs. They mentioned that they have faced challenges while applying for work placement, and they have realised even the most basic requirements of the job are now influenced by technology. They also added: The job market has changed so much in recent years, universities of applied sciences are falling behind in providing students with demand skills,

or even future skills. They said they should learn to work with software more instead of paper and pencil. The interview became very interesting as more open-ended questions were asked. It was evident from their response that they were completely dependent on the degree, and the interviewer felt that it is also students' responsibility to learn different skills on their own, so they were asked if they should give time to learn new skills. They responded that as part-time jobs and course assignments keep them busy, it is very unlikely that they will have time to study online through the internet to upgrade their skills.

Students seven and eight are from Aalto university. According to them, they were not ready for accounting jobs until they found a job and started working. They noted that the knowledge they acquire from their degree is more theoretical, and theoretical knowledge does not prepare them for the jobs they intend to pursue. Student seven personally added: "the things I have learned in my university have not been beneficial because it is such a little thing that I have learned to do. I have had many problems while I started working with various programs, but I was lucky to learn quickly". In some of their courses, they said they were working with different programs that were very useful. However, it was insufficient and would be good to have in many other finance courses. When they entered in job market, they realised half of the things they learned in their university was not useful and they wished that they would be better at using python or PowerBI because many workplaces require applicants to have some skills on it.

Students nine and ten are international student. They studied in University of Waikato in New Zealand. Both students mentioned that they are prepared quite well to start working in accounting jobs. They are facilitated with many useful lectures and workshops. The lectures offered are very intense, technology-based, and theory-based. As their degree does not include compulsory work placement, they were asked how difficult it would be to find an introductory level job based on technology and they mentioned it would be challenging to find job; however, their university is well preparing them to face the obstacles. Their university is providing multiple resources for workshop to help facilitate their learning better. In relation to their major, they have workshops to familiarise with Microsoft software, specifically excel. Overall, they were very delighted with their degree program and feel well prepared for accounting jobs.

Student Eleven is also an international student and currently studies at Boston International College, affiliated with Pokhara University. The interviewee said that he/she is not prepared for accounting jobs. The knowledge acquired from the college is not preparing for accounting jobs. It was stated that technological advancements are

changing working environments, especially in accounting as, it requires a lot of manual labour. The course content is more theoretical and less practical from the students' perspective which makes it harder for them to find work. In addition, it was mentioned, universities consider technology to be very unimportant and take it very lightly.

4.2.5 What knowledge have students acquired in AI and RPA at university?

This subchapter will focus on the interview results related to investigative question five, which inquires the knowledge of Artificial Intelligence and Robotic Process Automation students achieved at their university.

The respondents were asked interview questions as well as many open-ended questions to get a clear answer. According to Haaga-Helia students, they know the terms AI and RPA but are not very familiar to answer anything about it. They were asked many questions regarding their knowledge acquired in AI and RPA at their university. They mentioned in their studies, they did not use any AI applications. They were not satisfied with the IT skills available in their degree program in Haaga-Helia. In one student's opinion, IT courses should be offered more flexibly. The courses offered were enough, but not for every student. In accounting and finance courses, they have not used any software that has helped or will help them in the future. They were asked if AI courses were offered in the university, how would it have helped them? And they said it would have helped them to best fit for the company and finding an internship could have been easier. One of the interviewees mentioned that even after completing all the finance and accounting courses, the interviewee was feeling insecure. Technology is so advance that everybody can experience in everyday life. They believe the most challenging part of entering the job market will be the technical skills in accounting, which may include understanding the basics of artificial intelligence and robotic process automation software. A more precise description would be being unable to put numbers into various software, being unable to understand what has gone wrong, and not being able to understand what is taking place. Additionally, they agreed that students should learn to adapt faster than before during the growing phase.

Students from Metropolia UAS stated that they did not have any AI or RPA related courses. They have not used any AI application or RPA software in their accounting and finance courses. In their opinion, accounting and finance students should learn about finance software since the job of an accountant goes beyond playing with numbers or having the ability to work with a pen and paper. They stated that, when they applied for the different accounting position, they realised having a basic understanding of SAP, ERP,

or specific software used for automation in accounting are necessary. They mentioned that they are unhappy with the offerings of IT skills in their degree program and the challenges for them are quite huge. Even after achieving the degree, they will lack many skills which they should get from their degree. As asked many open-ended questions, they strongly agreed that it is also their responsibility to adapt to the change and actively learn the new skills. Additionally, they pointed out that accounting skills are learned very well, but technology skills are not taught as much. Also, they mentioned they are offered basic and intermediate courses, but much more is in demand in the job market. The interviewer asked how good they were at using excel they noted they have used excel in every accounting and finance course, but they always had a problem using more than the basics. As we were discussing the challenges technology will bring to accounting students, they commented that most of the basic skills they have acquired at their university now can be automated with RPA and AI, so there will be a lack of opportunity for them.

Students from Aalto university mentioned that they had acquired the basic understanding of AI because they are offered one AI course. They have heard of RPA, but they do not know any practical examples other than the basics of what it is for and how it is used. So, they said it feels abstract to them. All they could say about RPA is that it is software that mimics humans and is placed on top of existing IT systems. As they said, they were offered an AI course, and the interviewer asked what they knew about AI. They stated, “techniques that allow humans to analyse data and make some predictions and better decisions” they have heard of machine learning, and they mentioned, “It is a continuous learning on its own without the need of human programming further”. They said AI is used in finance courses for different stock predictions and many more, but they have not practically used them. They have talked about AI programs in the courses, but they have not acquired any broader knowledge in AI or RPA. In their opinion, it would have helped them quite a lot if they were offered to use AI software/programs or RPA software during their studies in finance and accounting. Additionally, they also think that some workplaces have very high requirements for jobs in their field, and they feel they should not require students to know different programs like python, Java, C++, SQL, Xero, when it is not even in their course structure. Furthermore, they want to change the course structure so that future Aalto students would not have to suffer finding a job.

International students from New Zealand answered that they are familiar with the concept, as it was mentioned in a few of their management papers. However, they do not have advanced knowledge. They only know the basics, such as how it can affect the

accounting profession, which comes with both advantages and disadvantages. They said they use accounting software such as Xero and MYOB. They mentioned that Xero is a cloud-based accounting program, and MYOB is an ERP solution and has an AI tool for advisory. They are taught this software to prepare for future job skills. They also stated it would be great for them to know more about AI and RPA because we all live in a very high-tech world, and students do not know what challenges they might need to face in the future. They want to obtain excellent knowledge in accounting with skills in AI and RPA. They mentioned that they should at least know the very basic to start working in the accounting companies. And getting the knowledge of AI and RPA should not be limited in their perspective.

International student from Nepal have mentioned that the student was not offered any AI or RPA courses to obtain any knowledge about it. In their studies technology do not take much importance and their studies are mainly focused on theory. The challenge for students is to adopt to the very fast-growing environment without any knowledge of advance technology. The student also added: the demand of accounting job in the job market is more advance than what they achieved in their university. The student said they lack many skills in terms of technology requirements in accounting. The only IT skills they know or have been taught in their degree program is the use of Microsoft software especially, excel.

5 Conclusion

The objective of this research was to find out if accounting students have developed artificial intelligence and robotic process automation competencies in the field of financial accounting. The challenges students might face in the future are because of the change in accounting work processes due to AI and RPA. The conclusion chapter of this thesis outlines the key findings of this research as well as their reliability, validity, and relevance. Suggestions for further research will also be presented along with other sub-chapters. The chapter will end with a personal reflection on learning.

5.1 Key Findings

The key findings from the results are that AI and RPA are going to bring challenges to students. Machine learning and expert system which are the subfields of AI are mostly used in accounting work processes such as accounts receivable, payables, payroll, monthly, quarterly, or yearly closing, internal performance reporting, general ledger accounting, cash management, inventory accounting and tax accounting can be automated with AI and RPA. The results also align with the theory. Students lack the skills needed to start a career in accounting; the very basic skills are Microsoft office skills along with some ERP and SAP programs.

Students have a good understanding of accounting, but they do not possess the required skills in terms of technology. Universities and the University of Applied sciences should offer students introduction courses on AI and RPA to help students pursue their accounting careers. According to the results, universities are offering students AI courses to understand the advance technology of the future better. Nevertheless, university students still feel that they have little knowledge of AI, and they should be taught more relevant accounting courses that use AI tools and RPA software.

The principle of accounting is the same whether accountants sit in front of a computer or an abacus. Nonetheless, what has changed is the technology we use. It has changed drastically. As a result of technology, the accounting industry has explored new avenues, created new products, and given its professionals the opportunity to develop new skills and perform new responsibilities. Accounting professionals no longer have to page through endless columns of information in hopes of avoiding error, a calculation that was once manual now happen automatically and consistently. For accountants to embrace and accept automation and artificial intelligence as part of their accounting practice, the advantages of automation and AI must be made clear to them, and they receive the

training and support they need to make the most use of AI. However, students who are currently studying should get trained to use basic tools of AI and RPA and most importantly, they should understand what AI and RPA is.

Students from Haaga-Helia and Metropolia are not familiar with RPA, and they do not know anything about AI. As companies participated in the interview process mentioned that RPA software, AI programming, and coding are key skills any accountant should be familiar with. Even the very basic processes of accounting such as Invoice processing are nowadays automated so, it is very must for new graduates to be able to understand the process happening in the computer and be able to identify what went wrong. If students do not know the basics of RPA and AI in accounting, it is a challenge for them to find a job as well as adapt to the change at the workplace. Students from Nepal is as well unaware of the terms AI and RPA. As interviewees mentioned, technology advancement in accounting is not just happening in Finland it is a worldwide phenomenon, student around the globe should know the change in accounting processes and learn to improve their accounting skills. As educational institutions are not teaching AI and RPA in accounting, it is up to accounting students to understand the future challenges and actively acquire the key skills needed to start a career in accounting.

Students from New Zealand are offered workshops in AI, and they use accounting software in accounting courses to prepare for the practical work. Even Aalto university is offering students one basic course, but Haaga-Helia and Metropolia universities of applied sciences do not provide students RPA and AI courses in accounting. Future students of Haaga-Helia and Metropolia should be taught to use RPA software and AI software in accounting courses. Business IT course offered in Haaga-Helia and Metropolia is not sufficient for students to use even the basic Microsoft office skills such as Excel.

Accounting students need to be more versatile and should always have a positive attitude towards learning new skills since the work of an accountant is going to change constantly as technology advances.

5.2 Reliability, validity, and relevance

This subchapter discusses the different actions taken by the researcher to ensure the reliability, validity, and relevance of the research.

Validity and reliability are important aspects of all research. It is important to pay close attention to these two aspects as it can make the difference between good research and

poor research and help to ensure that the academic researcher will accept findings as credible and reliable. The validity of research concerns the accuracy and honesty of results. To establish reliability, the source of the data needs to be clearly identified, whether it comes from an interviewee or from the author themselves. (Brink 1993, Flick 2009, 387). A qualitative study's validity depends on carefully prepared interview questions. In other words, questions should not be suggestive, but the interviewees should be free to respond according to their own opinion. Furthermore, it is important that the questions be clear and precise to collect relevant data. (Saunders & al. 2016, 400-401).

When preparing the questions, the reliability and validity was taken into consideration, questions were prepared by the author. The results collected are reliable as the interviewees are professionals in accounting, RPA, and AI. The answers given by professionals are based on truth and based on their experience. For the proof that the professionals and students were not forced to participate in answering the interview questions, they were recorded. In the results section, all the interviewees who desired to participate in the interview were interested in answering the questions and considered the topic to be of significant personal interest.

5.3 Recommendations for Future Research

As the research presented here is quite new. There is a lot of opportunity for more research in the future.

This research only includes the impact of AI and RPA in accounting work processes, and the challenges students might have to face if they have not acquired knowledge in AI and RPA. The data collected were from a small population, it would be worth researching with large data collection. It would be more interesting to find how larger accounting companies have applied AI and RPA in accounting and their impact to their employees. The implementation of AI and RPA in accounting is limited in medium-sized businesses since AI in accounting is quite expensive and must take into consideration many factors.

It would be worth researching what the educational institutions think of their study offerings to accounting students. University and university of applied sciences consider in this research was limited so it would be worth considering every university and university of applied sciences around the globe. Using artificial intelligence and robotic process automation can do more than automate accounting processes. It would be great to find out more about how AI can be applied across the entire accounting industries and its

advantages and disadvantages. Research can be conducted considering international aspects. Research on this subject is more interesting in the future because it is a very new topic that is going to bring a lot of change in the future. It can be considered that since the scope of this research only focused on one sector of accounting work processes, what the considerations are for various steps and what new jobs are going to be created in the field of accounting.

5.4 Reflection on Learning

My experience in this thesis process has been highly educational and interesting for me. Conducting this research gave me an opportunity to explore an area of interest, which is accounting involved with Artificial Intelligence and Robotic Process Automation. I was always keen to know the impact of advanced technology in accounting. From my own experience, I have not acquired any skills in AI and RPA while studying in Haaga-Helia. I was always concerned if it was only me feeling less prepared for accounting jobs, but the research process helped me find out that students are less prepared and eager to develop their skills.

AI in accounting is still a new topic and not yet highly researched. The research process was exciting. The essential thing I learned from my thesis was scheduling. As I am also doing my work placement, it was very challenging to manage time. It was also a lot of work to find interviewees, many interviewees were interested, but it was the closing of the year for many accounting companies, they were super busy and could not participate. Additionally, this thesis taught me to step out of my comfort zone and helped me to enhance my networking.

Another aspect I learned during this research was handling the stress and having patience. At one point, it was very frustrating to continue writing as it required a lot of dedication and hard work. I was already stressed from my work, and writing my thesis day and night affected my mental health. As a result, I learned to cope with difficult situations, and the topic was also my area of interest, which helped me remain motivated during the research process.

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Appendices

Appendix 1. Interview Questions for Professionals

1. What is your job title? What are your main duties in accounting/RPA/AI?
2. How many years of experience do you have in accounting profession or in AI profession or in RPA?
3. What applications have you used that include AI in the background or as the main process?
4. What are the main usages of AI/RPA in business?
5. What are the main usages of AI/RPA in the field of accounting?
6. Some accounting work such as AR, AP, and expense reports can be automated with machine learning- How do you think this affects the knowledge and competences required of new accounting graduates?
7. In the field of Accounting consultancy, advising, analysing, controlling, and planning, expert systems are used, how do you think this change the work of accountants? How has it affected the work already?
8. AI/RPA changes the way people work and it may cause uncertainty about jobs, what kind of concerns have you seen, or do you expect among students of finance and accounting?
9. If we think about AI/ RPA competences of new accounting graduates, how well do you feel they are qualified to start working in accounting and finance? What skills do you feel they are missing? Do you think they already have few skills?

Appendix 2. Interview Questions for students

1. What is your name? What is your profession?
2. Where do you study? What is your university name?
3. What are you specializing in?
4. How well do you know the terms Artificial Intelligence and Robotic Process Automation?
5. How prepared are you to start your career in accounting?
6. Do you think your university is providing you with the required number of courses for IT skills?
7. Have you used an Artificial Intelligence application in your studies? Do you think Artificial Intelligence courses should be offered in universities? How would have it helped you?

8. In terms of skills requirements based on technology, how difficult was it to find an internship?
9. How difficult will it be to find an introductory level of job in terms of skills requirements based on technology? After graduating from your university. (International students from abroad)
10. Advanced technology is changing the work of an accountant. What challenges do you think this will bring to accounting students?