



RPA & AI in Accounting Systems – Inbuilt or Not? Deployment Issues

Aza Arsamakova

Haaga-Helia University of Applied Sciences

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Author(s)

Aza Arsamakova

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This research-based Bachelor's thesis discusses the role of robotic process automation (RPA) and artificial intelligence (AI) in accounting systems. The primary objective of the study was to examine the automation solutions of the five most popular accounting software in Finland. The study focused on answering what kind of automation solutions were inbuilt/added on in the five most popular accounting systems and how they were implemented.

The thesis includes a theory part and an empirical part. The theory part discusses accounting information systems and their processes as well as the application of RPA and AI in accounting based on relevant literature and Internet sources. The empirical part focuses on research findings and future development recommendations. The empirical part is divided into two phases: accounting software and webpages analysis, and interviews. The research was based on qualitative methods. First, five accounting software were analyzed by the author using the information from official accounting software webpages. Second, the unstructured interviews were carried out with accounting software representatives to confirm the found information and to obtain views from the software providers' perspectives. Two out of five accounting software representatives were interviewed. One accounting software representative refused to participate in the interview, the two remaining ones did not reply to interview requests. The results were analyzed using comparative and narrative analysis.

The author's research using accounting software webpages found that automation solutions (either inbuilt or add-on) were mostly applied in the expenditure cycle of five accounting software. Some accounting software had the requirements for accounting solutions implementation on their webpages, others did not. On the whole, the requirement to start using AI was to maintain accounting accuracy, and the requirement to start using RPA was to learn to apply RPA to record/automate tasks with the help of instructions. The interviews confirmed the information gained from the author's study and indicated that users of software did not need to have computer programming or any other additional skills to start using automation solutions. They also showed that accounting software companies do not focus on developing both RPA and AI, rather they prefer to concentrate on one of them.

A further recommendation for the commissioning company is to investigate the remaining accounting software included in the research done by financial magazine Tilisanomat. The commissioning company should also concentrate on the price policies of accounting software and ethical issues related to the implementation of AI in accounting software.

Keywords

Accounting Information Systems, Robotic Process Automation, Artificial Intelligence

Table of contents

1	Introduction	1
1.1	Background.....	1
1.2	Research Question and Demarcation	2
1.3	Benefits.....	4
1.4	Key Concepts	4
1.5	Commissioning Company	5
2	RPA & AI as Accounting Solutions for SMEs.....	6
2.1	Accounting Information System and Its Processes.....	6
2.1.1	The Revenue Cycle.....	9
2.1.2	The Expenditure Cycle	10
2.1.3	The Human Resources Management and Payroll Cycle	12
2.2	Application of Robotic Process Automation in Accounting.....	14
2.2.1	Cash and Account Reconciliations	16
2.2.2	Receivables and Sales.....	17
2.2.3	Inventory	17
2.2.4	Accounts Payable	17
2.2.5	Financial Reporting	18
2.3	Application of Artificial Intelligence in Accounting	18
2.3.1	Cash and Account Reconciliations	19
2.3.2	Receivables and Sales.....	19
2.3.3	Inventory	19
2.3.4	Accounts Payable	20
2.3.5	Management Accounting Applications.....	20
3	Research Methods	21
3.1	Research Design	21
3.2	Population and Data Collection	22
3.3	Data Analysis Methods	25
3.4	Reliability and Relevance.....	26
4	Results.....	28
4.1	RPA and AI Solutions in the Transaction Cycles of Accounting Software.....	28
4.2	Requirements for RPA and AI Solutions Implementation	32
4.3	Expertise and Competencies for RPA and AI Solutions Implementation	35
4.4	Plans for Developing RPA and AI Solutions Further.....	35
5	Discussion.....	38
5.1	Key Findings	38
5.2	Recommendations and Further Research.....	40
5.3	Reflection of Learning	41
	References	43

Appendices47
Appendix 1. Interview questions47

1 Introduction

This is a research type of a bachelor's thesis for the Degree Programme in International business in the major specialization of Financial Management at the Haaga-Helia University of Applied Sciences. The purpose of this chapter is to present the topic and the aim of the thesis including the central concepts of the report.

This thesis is a part of the Haaga-Helia University of Applied Sciences "Center of Intelligent Process Automation for SMEs" (CIPAS) project. The objective of the project is to develop a specialized training center where various experts can provide small and medium-sized enterprises (SMEs) with the technology and services SMEs need.

The thesis aims to obtain information about automation solutions of the five most popular accounting systems in Finland and the way they are implemented. Automation solutions comprise both robotic process automation (RPA) and artificial intelligence (AI) which are becoming vital in accounting and finance.

Moreover, during the COVID-19 pandemic, there is an increase in the use of automation technologies as they support organizations. COVID-19 influence on how work is accomplished (for example, remote working) forces companies to implement automation in their business processes. According to an article from the website of the audit, financial advisory, and consulting company Deloitte, the challenge for most companies nowadays is not how they will accept intelligent automation in their organizations, but rather how they apply it carefully and to their greatest advantage. Deloitte's research shows that during two years of a pandemic the number of companies that deployed automation has tripled. This proves that COVID-19 which led to remote working, which in turn resulted in increases in business processing requirements, finally accelerated automation. (Horton & al. 2020.) Therefore, the result of the research is an essential component of the CIPAS-project which aims to help smaller companies to implement automation projects.

1.1 Background

According to the research conducted by the professional financial magazine Tilisanomat in October 2021 (Lyytinen & Fredman 2021) where more than two thousand accounting specialists responded to the survey, the following five accounting software out of the fifteen most sold ones were named as the most popular among accounting service professionals in Finland:

- Procountor 24%
- Visma Fivaldi 19%
- Netvisor 17%

- Fennoa 8%
- Asteri 7%

The survey respondents estimated the percentage of customers they used the accounting software for (considering that 30% of respondents used two accounting software and 20% used three or more) and then researchers combined this information with the number of users of each accounting software. That is how the accounting software market share was determined.

According to Hasanah, Yusuf, Pahala, and Sakina (2021, 8), with the help of information technology businesses can operate more efficiently and effectively ensuring the quality of their performance. Furthermore, in the article authors state that information technology improves the quality of financial reporting of SMEs making them more reliable and accurate while reducing the preparation time.

The research organized by Suomen Yrittäjät and Elisa Oyj (Suomen Yrittäjät 2019) shows that SMEs face challenges with digital transformation. The main barriers to digitalization named in the research are lack of time, identification of company needs, and finding the right solution. The data obtained in this thesis will assist companies when choosing suitable accounting software with the automation solution that is relevant to the company.

1.2 Research Question and Demarcation

This thesis aimed to investigate the automation solutions of five different accounting systems and their implementation. The international aspect required by the degree program is covered by the fact that the CIPAS-project is funded as part of the European Union's response to the Covid-19 pandemic (Haaga-Helia s.a.) and the usefulness of the result of the thesis for both national and international SMEs in Finland.

The research question (RQ) of this thesis: What kind of automation solutions are inbuilt/add-ons in the five most popular accounting systems in Finland and how they are implemented? The research question was divided into investigative questions (IQ) as follows:

IQ 1. Which robotic process automation (RPA) and/or artificial intelligence (AI) solutions are inbuilt/add-ons in the accounting software and which transaction cycle they are part of?

IQ 2. What are the requirements for implementing RPA and/or AI solutions in the accounting software?

IQ 3. What expertise and competencies does the company need to implement RPA and/or AI in the accounting software?

IQ 4. How are the accounting software companies planning to develop RPA and/or AI solutions further?

The overlay matrix table (table 1) below presents the investigative questions, theoretical framework components, research methods, and results chapters for each investigative question. A comparative qualitative analysis of accounting software was performed in order to answer IQ 1. Interviews were conducted and the narrative analysis of unstructured interviews with software providers was utilized as a way to answer IQs from 1 to 4.

Table 1. Overlay matrix

Investigative question	Theoretical Framework	Research Methods	Results (chapter)
IQ 1. Which robotic process automation (RPA) and/or artificial intelligence (AI) solutions are inbuilt/add-ons in the accounting software and which transaction cycle they are part of?	Comparative qualitative analysis and unstructured interview	Comparative qualitative analysis of accounting software and narrative analysis of unstructured interviews with software providers	4.1
IQ 2. What are the requirements for implementing RPA and/or AI solutions in the accounting software?	Comparative qualitative analysis and unstructured interview	Comparative qualitative analysis of accounting software webpages and narrative analysis of unstructured interviews with software providers	4.2
IQ 3. What expertise and competencies does the company need to implement RPA and/or AI in the accounting software?	Unstructured interview	Narrative analysis of unstructured interviews with software providers	4.3
IQ 4. How are the accounting software companies planning to develop RPA and/or AI solutions further?	Unstructured interview	Narrative analysis of unstructured interviews with software providers	4.4

This thesis focuses on the five most popular (by market share) accounting software in Finland (Lyytinen & Fredman 2021). This thesis does not focus on large companies

because large companies can already have built-in and/or added on automation solutions for their accounting and other systems. This thesis does not include less popular (less used) accounting software because the commissioning organization requested to research five software only and it was not possible to investigate all of them during this case study. Although accounting activities can be performed manually by a person without the implementation of digital technology, the thesis concentrates on accounting tasks that are done in accounting software.

1.3 Benefits

This thesis benefits the commissioning company, B2B clients, and the author. The thesis benefits the author because through this research she expands the understanding of automation systems and how they are used in accounting software. This will be useful for her career in finance and accounting because the accounting software is used in the finance field on a daily basis and automation solutions help save time.

Access to some of the accounting systems was considered as an issue when this research started as they are paid in most cases. In this case, the author planned to use the free trial or change the software she was working with. The interviews with the companies that offer accounting systems solutions were believed to be successful.

1.4 Key Concepts

Accounting information systems (AIS). Sari, Afifah, Susanto and Sueb describe accounting information systems as a group of interconnected tools, procedures, machines, and software that cooperate in order to produce financial data analysis (Hashem & Algatamin 2021).

Automation – is the application of tools to automatically perform a task that is usually performed by a human (Romney, Steinbart, Summers & Wood 2021, 174).

Hyperautomation – an integration of robotic process automation tools and machine learning applications (Ng & Alarcon 2021, 110).

Machine Learning – is an application of artificial intelligence that allows computer systems to learn and improve without human intervention. (Romney & al. 2021, 220.)

Expert Systems – is a software program that imitates human decisions using a rule-based program (Ng & Alarcon 2021, 109).

Robotic process automation (RPA) is a software- and rule-based application that automates daily tasks or structured data through replication of human actions (Ng & Alarcon 2021, 111).

Artificial intelligence (AI). As specified by Haenlein and Kaplan, artificial intelligence is the ability of different machines and digital devices to accomplish tasks so that it imitates human behavior. Imitation includes, for example, thinking and learning, therefore AI learns on its own based on the given data (Hashem & Algatamin 2021).

Inbuilt – devices or features that are not separate but rather included in something as a part of it (Collins Online Dictionary s.a.b).

Add-on – a tool that can be added to existing computer equipment in order to improve its performance or its usefulness (Collins Online Dictionary s.a.c).

1.5 Commissioning Company

Center of Intelligent Process Automation for SMEs (CIPAS) which provides services for micro- and SME companies is the commissioning organization for this thesis. The project is done by Haaga-Helia staff and financed by the Centre for Economic Development, Transport and the Environment (ELY-center) and the European Social Fund (ESF). (Haaga-Helia s.a.)

CIPAS-project, which was started in the autumn 2021, aims to create a competence and training center for SMEs in order to promote digital financial management. Digital financial management will allow SMEs to improve their business processes and therefore increase sales. CIPAS-organisation is the place where companies are able to network and launch their first automation projects with expert advice and assistance. (Honka & Kortessalmi 2021.)

2 RPA & AI as Accounting Solutions for SMEs

This chapter describes the theoretical framework of the thesis. The theoretical framework concentrates on accounting information systems (AIS), and the processes accounting software involves. It also focuses on robotic process automation (RPA) and how it is applied in accounting as well as on artificial intelligence (AI) and its application in accounting. The question to answer during the research is whether RPA and/or AI solutions are available in the five most popular accounting software in Finland and if they are inbuilt in the software or work as an add-on. Also, how these solutions are implemented and how they are deployed by the users – is part of the research question.

Concisely, five selected accounting software are analyzed and compared to each other in order to understand how these automation solutions (both RPA and AI) are implemented and deployed. In addition, it is essential to discover the ways RPA and AI solutions can be developed further in the accounting software. Therefore, the theoretical framework is the knowledge base of this research. Figure 1 illustrates the theoretical framework of the thesis.

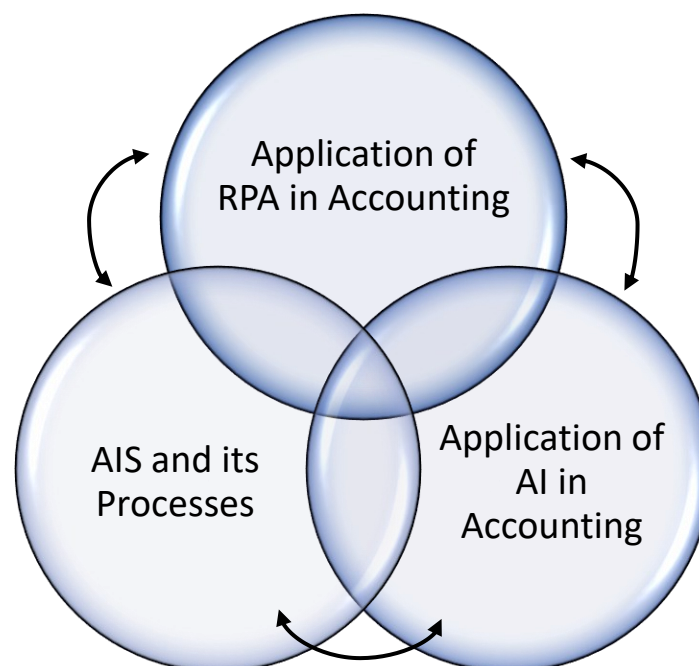


Figure 1. RPA & AI as accounting solutions for SMEs

2.1 Accounting Information System and Its Processes

An information system (IS) is a combination of people and technologies in an organization. The combination of these players generates information through collecting, recording, storing, and processing data that helps organizations to make effective

decisions. (Romney & al. 2021, 31.) The components of an information system are illustrated in figure 2.

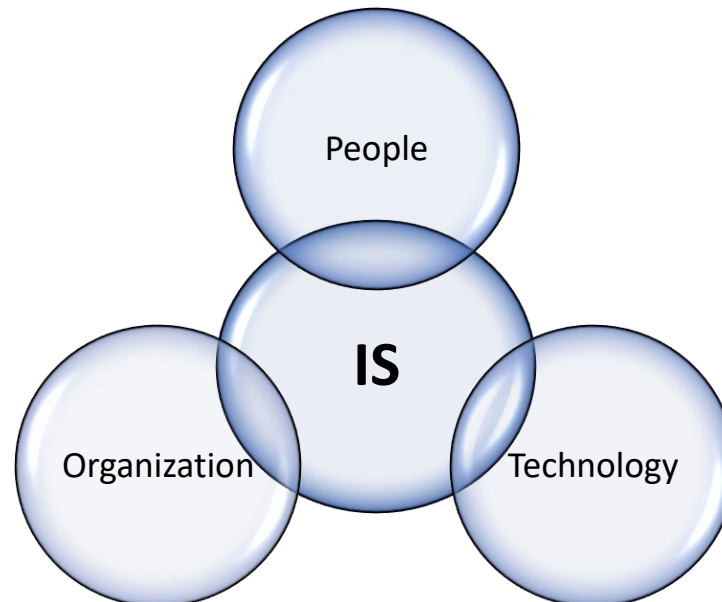


Figure 2. The components of an information system (adapted from Romney & al. 2021, 31)

Companies are usually involved in many business processes such as for example, sales and purchases. Each of these processes affects the financial situation of the company and management needs to know how much money they earned and spent. For example, sales increase the cash of the company but paying the employees reduces it. These examples include the reasons why the accounting information system (AIS) must acquire and record accounting information related to the business processes of the company. The AIS consists of processes, procedures, and systems that obtain accounting data from business activities, record it in the proper records, then classify, summarize, consolidate the accounting data, and finally report accounting data to the internal and external users. (Turner, Weickgenannt & Copeland 2020, 2-4.) A well-planned AIS adds value to an organization by, for example, making better the quality of products and services, improving production and internal controls efficiency while reducing the company's costs. (Romney & al. 2021, 37-38.)

The essential business aims that can be achieved by using the AIS and which are shown in figure 3 include (Romney & al. 2021, 37.):

1. Collecting and storing information about business activities, resources, and employees
2. Converting the data into information so that it becomes possible to plan, control, and evaluate business activities, resources, and employees
3. Providing controls to protect companies' resources and data

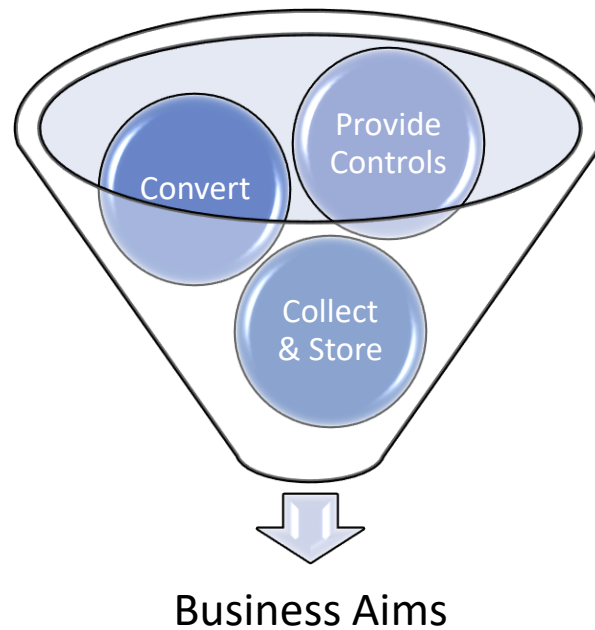


Figure 3. Business aims fulfilled by accounting information systems

To manage a company effectively, managers should: (1) understand how their business functions, (2) identify the important information they need (3) in order to make key decisions for each business process their company is engaged in. (Romney & al. 2021, 32.) Accountants, on the other hand, must understand how the information is entered, processed, and reported in the accounting information system so that it would be possible to generate accounting reports for management. Accountants can be the users and/or auditors of the AIS as well as the part of the team that designs and implements the AIS. They should be involved in the decisions making process in an organization when it comes into question which accounting software to buy, and how to design and implement it. (Turner & al. 2020, 22.)

If the company wants to have a successful and effective AIS, it should consider several AIS objectives properly. For example, the AIS should be easy to understand and use, the advantages of using the AIS should be greater than its costs, the access to the AIS should be granted to only authorized users. (Romney & al. 2021, 734-735.)

Each business process includes business activities and tasks that are involved in give-get exchanges. Give-get exchanges can be categorized into five transaction cycles (Romney & al. 2021, 33-34.):

- *The revenue cycle*, where companies sell goods or/and services in exchange for cash or a promise to collect cash
- *The expenditure cycle*, where companies purchase inventory or/and raw materials for resale or for further production in exchange for cash or a promise to pay cash
- *The production cycle*, where raw materials are converted into finished products

- *The human resources/payroll cycle*, where employees are, for example, hired and trained
- *The financing cycle*, where companies pay dividends or borrow money, among other finance activities

In this thesis, just the revenue cycle, the expenditure cycle, and the human resources/payroll cycle are described in more detail. This was done mostly because SMEs rarely manufacture goods themselves, sell shares or pay dividends to their shareholders.

As specified by Romney, Steinbart, Summers and Wood (2021, 35), many accounting software packages have the transaction cycles added into them as different modules. This is because not every company needs all these modules. If a company does not have, for example, a production cycle, it would not need to apply the production module.

2.1.1 The Revenue Cycle

The revenue cycle is a repeatedly occurring set of business activities related to selling goods and services to consumers and getting the cash for sales. Its main goal is to make the right product available in the right place for the right price and at the right time. In the revenue cycle, the main external exchange of information happens with customers. Moreover, details from the revenue cycle proceed to the other accounting cycles. For instance, information about sales transactions is needed when the expenditure cycle wants to begin the purchase of new inventory. Four revenue cycle activities help companies to accomplish their main objective: 1) sales order entry, 2) shipping, 3) billing, and 4) cash collections. (Romney & al. 2021, 454-455.) Turner, Weickgenannt and Copeland (2020, 266) add the sales returns process as an important part of the revenue cycle processes.

The revenue cycle starts with the *sales order entry*, the process of which consists of three steps: 1) taking the customer's order (for example, through the company's website), 2) checking and approving customer credit (in case of a credit sale), and 3) checking inventory availability. (Romney & al. 2021, 459.)

The second business activity in the revenue cycle is *shipping* the product to the customer. This activity includes two steps: 1) picking the order from the warehouse and packing it and 2) shipping it to the customer. (Romney & al. 2021, 467.)

The third business activity in the revenue cycle includes *billing* customers, the process that contains two tasks: 1) invoicing the customer and 2) updating accounts receivable based on the sales invoice. (Romney & al. 2021, 471.)

The last business activity in the revenue cycle is *cash collections* – collecting payments from customers, for example, through online bank transfers. (Romney & al. 2021, 477.) The revenue cycle also includes updating the accounting records that were affected: revenue, cost of goods sold, accounts receivable, cash, and inventory (Turner & al. 2020, 253). The revenue cycle activities are presented in figure 4.

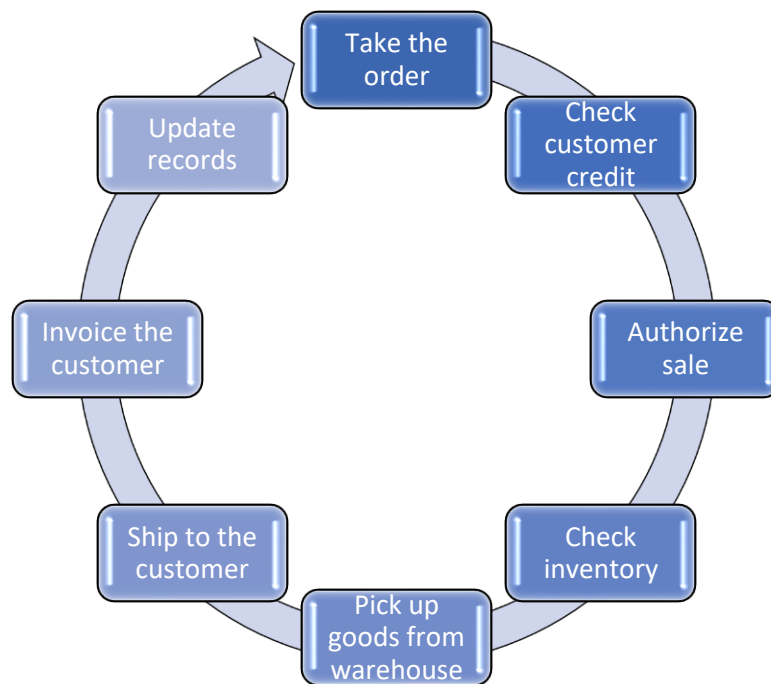


Figure 4. The revenue cycle activities (adapted from Turner & al. 2020, 258)

Companies have to be ready for the situations when customers return the sold goods. In such cases, the *sales return* activity includes the following tasks: 1) receiving the goods and matching them to the original sales invoice, 2) adjusting the amount the customer owes to the company or sending a refund to the customer, and 3) placing the goods back in the inventory or registering them as damaged. (Turner & al. 2020, 266.)

2.1.2 The Expenditure Cycle

The expenditure cycle is a periodically occurring set of business activities related to the purchase of and payment for raw materials, finished goods, services, and supplies. The key aim of the expenditure cycle is to lower company costs. In the expenditure cycle, the main external exchange of information happens with suppliers. If a company needs to purchase goods, the information about the need for purchasing will run to the expenditure cycle from the revenue cycle along with other company departments. (Romney & al. 2021, 495-496.)

There are four expenditure cycle activities that a buyer company needs to perform, and those activities are linked closely to the seller's revenue cycle activities. For example, the cash collection, which is the revenue cycle activity, is a mirror image of the cash disbursement, which is the expenditure cycle activity. The comparison of revenue and expenditure cycle activities is shown in adapted table 2. Furthermore, when companies apply new information technology developments to renew their expenditure cycle activities, they create an opportunity for sellers to renew their own revenue cycle activities. This process works the opposite way as well – when companies modify their revenue cycles, this creates opportunities for their customers to redesign their own expenditure cycles. (Romney & al. 2021, 496.) Sometimes companies must start the purchase return process, for example, because of the defects in goods or discrepancies in quantities. (Turner & al. 2020, 326.)

Table 2. Comparison of revenue and expenditure cycle activities (adapted from Romney & al. 2021, 498)

Revenue Cycle Activity	Expenditure Cycle Activity
1) Sales order entry	1) Ordering of materials, supplies, and services
2) Shipping	2) Receiving
3) Billing	3) Processing invoices
4) Cash collections	4) Cash disbursements

The first business activity in the expenditure cycle is *ordering materials, supplies, and services*. The process covers identifying what, when, and how much to purchase (the company can either carry a great amount of inventory, plan production to meet forecasted sales, or plan production to meet customer demands), and after that choosing from which supplier to purchase considering the price, quality of materials, and dependability in performing deliveries. (Romney & al. 2021, 503-506.) First, a purchase request with needed items and quantities has to be prepared and approved by the management. After that, a purchasing agent selects a vendor, creates a purchase order (PO), and sends it to the vendor. (Turner & al. 2020, 312-315.)

The second business activity in the expenditure cycle is the *arrival/receiving and storage of ordered products*. When ordered items arrive, it needs to be verified that the items were ordered. This is done by counting the quantity of delivered goods and checking them for signs of damage. (Romney & al. 2021, 509-510.)

The third business activity in the expenditure cycle is *processing/approving supplier invoices* for payment which is done by the accounts payable department. The accounts payable department matches the invoice with a related purchase order. Once it is verified

that the company received what they ordered, the invoice is approved for payment. The process of matching received invoices to purchase orders is suitable for automation. (Romney & al. 2021, 512-513.)

The last business activity in the expenditure cycle is *cash disbursements* – paying suppliers for what was ordered. When the invoice is approved by the accounts payable department, it can be paid. (Romney & al. 2021, 515.) The expenditure cycle also includes updating the accounting records that were affected: accounts payable, expenses, cash, and inventory (Turner & al. 2020, 312). The expenditure cycle activities are presented in figure 5.

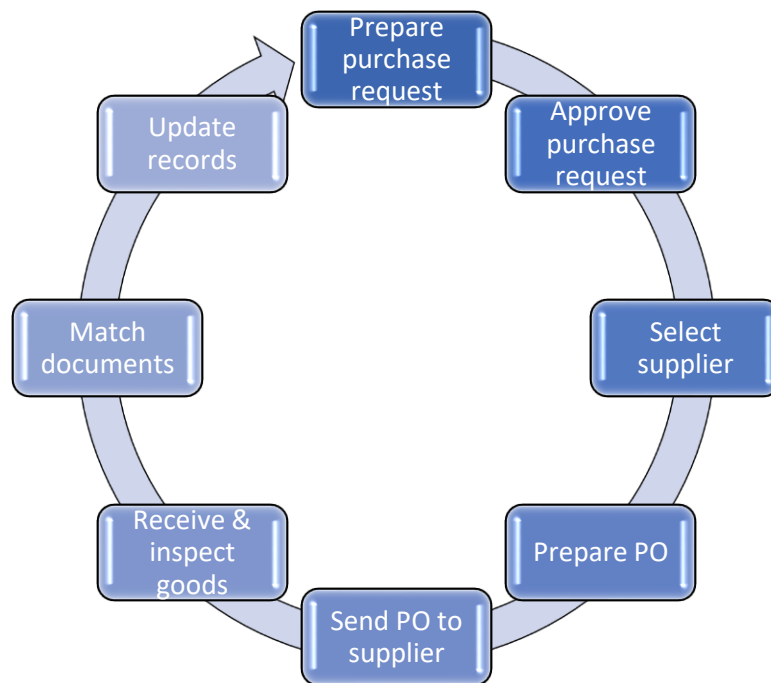


Figure 5. The expenditure cycle activities (adapted from Turner & al. 2020, 315)

The discrepancies in received goods can be detected immediately or later, for example, if goods were defective. Thus, the company needs to initiate the *purchase return* to the supplier. The purchase return activity includes such steps as 1) matching goods to the PO and returning them to the supplier, 3) adjusting the amount owed to the supplier or receiving a refund, and 4) updating inventory. (Turner & al. 2020, 326-329.)

2.1.3 The Human Resources Management and Payroll Cycle

The Human resources management (HRM) and payroll cycle is a recurring series of business activities linked with managing the company workforce. The main tasks of this cycle comprise recruiting and hiring new employees, training employees, work assignments, compensation for work, performance evaluations, and termination of

employment. Compensation for work is the payroll system's main function. Other tasks are performed by the HRM system. (Romney & al. 2021, 563.) The basic business activities are performed in the payroll cycle which includes five payroll cycle steps: 1) update payroll master database, 2) validate time and attendance data, 3) prepare payroll, 4) disburse payroll, and 5) disburse taxes and other deductions. (Romney & al. 2021, 570.) Some activities involved in HRM/payroll cycle do not occur regularly, i.e., hiring and firing the employee. Others occur systematically – usually, biweekly, monthly, or quarterly, i.e., paying wages and salaries. The payroll process starts when the company hires, terminates, or changes the status of an employee. It continues with the routine weekly and monthly payroll activities. (Turner & al. 2020, 369; 372.)

The first activity in the HRM/payroll cycle involves *updating the payroll master database* to show hires, terminations, changes in salaries, tax rates, and insurance deductions that happen in the company. (Romney & al. 2021, 570.) The master database which is updated by the human resources department on a regular basis includes information for each employee and each job, job vacancies, and recruitment efforts. In addition, the human resources department keeps records of employees' personal data (i.e., address and social security number). (Turner & al. 2020, 372; 374.)

The second activity in the payroll cycle is to *validate/confirm company employees' working time and attendance information* (with the help of a time card or informal monitoring by supervisors, for example). (Romney & al. 2021, 571.) Time cards need to be collected, reviewed and approved by management before arranging payroll for each employee (Turner & al. 2020, 402).

The third activity in the payroll cycle is *arranging payroll* for each employee. In order to calculate net pay which comprises the amount that is paid to each employee, all deductions are subtracted from gross pay. After that, a paycheck and payroll register with the information about gross pay and deductions are prepared for each employee. (Romney & al. 2021, 573-574.)

The next activity is a *payroll disbursement* to employees. In this step accounts payable inspects and approves the payroll register. After that, the net pay can be transferred to the employee's bank account. Employees also receive a copy of the paycheck which shows the amount received by them. (Romney & al. 2021, 577.)

The last payroll activity is to *calculate and send payroll taxes and employer-paid benefits as well as voluntary employee deductions* to the government entities (for example, social

security taxes). (Romney & al. 2021, 579.) The HRM/payroll cycle activities are presented in figure 6.

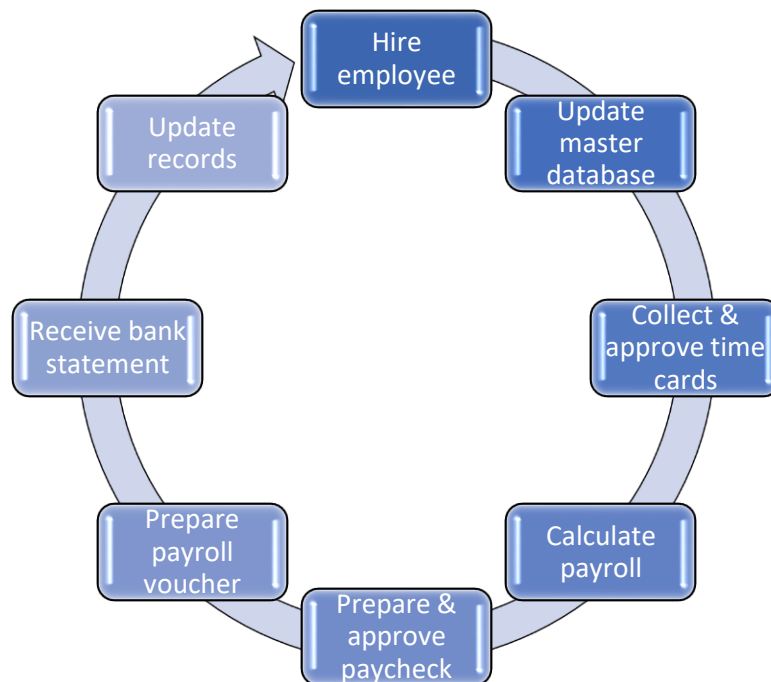


Figure 6. The HRM/payroll cycle activities (adapted from Turner & al. 2020, 377)

2.2 Application of Robotic Process Automation in Accounting

Robotic process automation (RPA) is a software application that helps to automate an organization's business processes by repeating tasks usually accomplished by humans. RPA manipulates and transfers data within digital systems and it can be used by organizations of all sizes and types. RPA users can create an RPA robot or RPA bot which is able to learn a business process. An RPA robot is not a physical machine but a software application. In most cases, the automation requires little coding expertise and is normally activated by applying a smart screen recording. Nevertheless, many companies that offer their RPA solutions, do not require their users to have programming skills. The only thing users need to do is to activate the robot to mimic keystrokes utilizing a smart screen recording, i.e., users show the robot what exactly they would like to automate. The replication of human activity happens through a graphical user interface (GUI). For example, an organization could automate the process of opening an email and downloading a document to a specific folder. Another example would be an organization that uses an RPA in order to process a large number of transactions, such as processing supplier invoices for payment. RPA utilization became very popular in recent years, and it will continue to grow because companies started to understand how productive, accurate, costs saving and profits increasing their business processes can be when they are automated. RPA bots accomplish tasks faster and more precisely than humans. (Ng & Alarcon 2021, 13; 35-38.)

In their research, Gartner forecasted that organizations would lower operational costs by 30% in 2024 through renovated operational processes and hyper-automation. In other words, automation of accounting processes is highly likely to increase the income of a company. (Computer SI s.a.)

An RPA robot can cooperate with various applications and moreover can navigate any technology platform. Some researchers believe that RPA should be taken as a form of AI. (Ng & Alarcon 2021, 35-36.) A joint report generated by the Canadian Institute of Chartered Accountants and the American Institute of Certified Public Accountants states that RPA by itself is not one of the parts of AI because it performs assignments utilizing pre-programmed instructions. Therefore, RPA robots do not make additional decisions and do not learn after completing their assignments (unlike AI). (CPA Canada & AICPA 2019) According to Ng and Alarcon (2021, 35-36), it is a matter of interpretation whether one wants to technically classify the RPA as AI.

Before starting to implement the RPA, an organization should carefully think about when the implementation is appropriate. Following Moffitt, Rozario, and Vasarhelyi (2018), the implementation of RPA is relevant when:

- existing processes are well understood
- tasks are of high quantity, and they are repeatable
- tasks are carefully considered; they have predictable results and investigated costs

Even though the costs for purchasing RPA licensing and RPA development can be high, it becomes less expensive during the maintenance period, and furthermore, the return on this investment improves impressively after the first year of usage. Also, RPA being a digital workforce that works day and night saves time and costs in the longer term. (Ng & Alarcon 2021, 38.)

As reported by Tornbohm and Leiter in their research “When and How to Use Robotic Process Automation in Finance and Accounting” done in 2019 (Ng & Alarcon 2021, 38-39.), it is particularly important for companies to understand the limitations of RPA in order to lessen the effort and money spent on failed activities. Tornbohm and Leiter estimated that 40% of organizations experience deep regret after implementing RPA projects.

The frequent mistakes that many organizations make during the implementation of RPA are listed in the report made by the professional services network EY in 2016. The report shows that these mistakes resulted in a 30% to 50% failure rate on initial RPA projects. These mistakes for failed RPA projects include, among others, such inaccuracies as automating too much of business processes or applying RPA to the wrong business

processes, and supposing that RPA alone is enough to increase a company's return on investment. (EY, 2016.)

There are three groups of challenges that RPA can be categorized into: technical, compliance, and process. A *technical* challenge of RPA robots is that they fail if they experience a condition that was not pre-programmed or, for example, if they were programmed with incorrect or incomplete information. An additional challenge of RPA is *compliance* with laws and regulations. In case there are automation errors in the system or problems when maintaining confidential information (e.g., social security numbers), they can decrease the accuracy of regulatory reports and lead an organization to legal violations. Lastly, it is pivotal to understand that RPA cannot make better a broken *process* or apply too complex a process because it would worsen the existing problem. Despite these challenges, the demand to automate business processes and accounting functions will increase in the future. (Ng & Alarcon 2021, 39.)

A Gartner study done in 2019 discovered that RPA can save 25,000 hours of repetitive work in accounting departments which would otherwise cost \$878,000 for a company with 40 full-time accounting employees. Nevertheless, the same study found that only 29% out of 150 corporate controllers, chief accounting officers, and chief accounting leaders implemented RPA for financial reporting purposes. (Lavelle 2019.) Hence, there is a huge opportunity for accounting and finance departments to start using RPA and thus make their financial reporting more accurate and less expensive. (Ng & Alarcon 2021, 42.)

TechTarget, a service company for B2B technology customers from the U.S., listed the ways RPA could help accounting departments. For example, when reconciling accounts, processing cash information (accounts receivable), processing invoices (accounts payable), and purchase orders, among others. (Lawton 2020.) Also, another consulting company, GGS IT Consulting, which specializes in software implementation, added to this list the following processes: inventory management and financial reporting. (Tajak 2022.)

2.2.1 Cash and Account Reconciliations

The process of account reconciliation (the procedure of comparing accounts balances) takes time and involves various processes depending on the company, its size, business requirements, information flow methods, and approval flows. RPA is the right decision to automate and therefore enhance the reconciliation process, as Lawton stated in his article. (2020.)

The automated reconciliation process presents the company's financial statements in a more precise and correct way. RPA makes the information entry, information withdrawal, and information verification perfectly accurate. That is, RPA robots do all the work including collecting transactional data, approval of documents that match as well as informing any deviations to the program user. (Tajak 2022.)

2.2.2 Receivables and Sales

There is an extremely high chance of errors when an accountant applies payments to accounts and invoices because the correct payments need to go to the correct account. RPA robots can automate the process, for example, so that at first RPA reads bank statements, then submits them in a suitable format, and, finally, copies the information to the specified areas in the accounting software. (Lawton 2020.)

Consequently, the accounts receivable process is a perfect process for automation which will make any accountant's job more comfortable and easier. Moreover, RPA can also improve the consumer master data system, sales quotation (an offer with a price and sales conditions), creation of invoices, and sending them to the customers. (Tajak 2022.)

2.2.3 Inventory

Nowadays many companies face supply-chain issues in their daily operations. That is why effective and accurate inventory management is especially important if companies want to be successful. RPA allows reducing costs while reducing inventory depletion. (Tajak 2022.)

RPA robot simplifies the process by checking the amount of inventory, predicting how much inventory is going to be needed, and making an additional inventory order if needed. With the help of RPA, the company can also automate its inventory accounting process, for example, record the information into financial records. (Tajak 2022.) RPA can also automate and thus accelerate the purchase order process (Lawton 2020).

2.2.4 Accounts Payable

Without automation, it is time-consuming and sometimes unreachable to get a proficient level of quality in the accounts payable process. Thus, the recurring process of receiving, approving, and paying invoices can be automated with the use of RPA. This is done as follows: RPA, after taking the information from the specified sources, matches invoices with purchase orders and if there is an issue with matching them, marks them. After that, invoices are sent to an accountant for approval. (Tajak 2022.)

Many companies' accounts payable departments process a vast number of invoices from the suppliers each month. These invoices can be in different languages and formats. RPA can help to reduce issues with document format and quality, etc. through, for example, digitalizing the invoice image into a text. After that, the obtained information is added to an accounting software system. (Lawton 2020.)

2.2.5 Financial Reporting

In order to keep track of their revenues, costs, and inventories, companies need to generate, update, and provide accurate financial reports. It is easier, more precise, and faster if a company uses RPA for financial reporting. RPA not only can create income statements and balance sheets but using historical data it can participate in planning and forecasting of sales, costs, etc. (Tajak 2022.)

Some companies produce financial reports daily, for example, in restaurants, and for them, it is essential to have RPA implemented in their accounting software. Therefore, company management can concentrate on other tasks without spending their time on the manual operations. (Lawton 2020.)

2.3 Application of Artificial Intelligence in Accounting

Artificial intelligence (AI) is a software application or computer program that can emulate human behavior. Although some experts claim that AI will reduce the demand for accountants in the future, and others predict it will help accountants to increase productivity while lowering costs, there is no doubt that AI applications will automate a significant part of the repetitive tasks done by accountants. (Ng & Alarcon 2021, 1-2.)

Artificial intelligence (AI) makes it possible for businesses (Marr & Ward 2019, 6-7.):

- to better understand and interact with customers: who the customers are, what services or/and products they want
- to offer more intelligent products and services, e.g., smarter phones, cars, and home devices
- to improve and automate business processes, e.g., the use of delivery robots in the retail industry or medical robots in healthcare

In their book, Cory Ng and John Alarcon (2021, 19-20.) provide examples of how AI can be deployed across different areas of the accounting industry. For example, AI can be distributed throughout financial accounting during such processes as cash and account reconciliations, receivables and sales, inventory, and accounts payable. AI can be used in management accounting as well.

2.3.1 Cash and Account Reconciliations

Bank reconciliation helps to protect cash and to improve the quality of accounting reports. Notwithstanding, the traditional bank reconciliation is time-consuming and can result in such errors as duplicate entries not to mention human-generated data entry errors, especially when companies have multiple accounts in various banks. Automating the process of bank reconciliation can solve these issues. For instance, an early form of AI called Expert Systems (ES) imports transactions from the bank and then matches them based on user-specified rules which do not change over time. After that, the ES creates reports on unreconciled transactions. (Ng & Alarcon 2021, 20.)

The system allows accountants to categorize any unmatched transactions and to produce an accurate report in a brief time. The newest AI technologies, such as machine learning (ML), can further improve the quality of automation of account reconciliation. For example, latest AI software deploys a set of instructions and develops an understanding of how to solve a specific issue. Each time an accountant makes a mistake, ML includes that error into its reconciliations process. This allows the ML to continuously learn and improve the process of account reconciliation. (Ng & Alarcon 2021, 20-21.)

2.3.2 Receivables and Sales

The cash application process involves matching incoming payments to outstanding invoices. The process is time-consuming, expensive, and complicated. Many organizations deal with numerous customers who use different payment methods (e.g., credit card payments, PayPal, etc.) and invoices in various languages and currencies, which makes this complex process with a large quantity of transactions open to errors. (Ng & Alarcon 2021, 21.)

The automated cash application process significantly reduces working hours, increases accuracy, and reduces costs. AI software collects all payments into a centralized place, then using ML matches them with invoices and records accounts receivable transactions. In many cases, AI solutions can be extended to meet customers' needs. (Ng & Alarcon 2021, 21-22.)

2.3.3 Inventory

Inventory management focuses on finding the right balance between excess inventory and demand forecasting since obsolete inventory can result in inefficient use of space and people. AI increases the success of inventory management because managers can easily determine and optimize appropriate inventory levels, predict customer demand, and

create supplier backorders. (Ng & Alarcon 2021, 22-23.) Hence, AI for inventory management helps organizations forecast the demand and leads to reinforcement learning.

Demand prediction includes integration with external data sources in order to discover, for example, how weather affects customers' behavior. Reinforcement learning is the type of ML process where AI software learns from its own actions and experience and proceeds in making purchase orders automatically. (Hamilton 2018). AI allows organizations to increase the safety and efficiency of their inventory management processes which is then resulting in customer satisfaction and retention. (Ng & Alarcon 2021, 22-23.)

2.3.4 Accounts Payable

The accounts payable process requires matching invoices to purchase orders and contracts in order to ensure that payments were approved for the correct amount and in accordance with purchasing contracts. If an organization can receive invoices in digital form, the application of AI becomes self-evident as it reduces manual work and increases the effectiveness of the accounts payable process.

AI software can match invoices to purchase orders automatically using the purchase order number, date, and amount. In case an invoice does not contain a purchase order number, AI can learn to approve the invoice by analyzing previously approved purchase contracts. (Ng & Alarcon 2021, 24-25.)

2.3.5 Management Accounting Applications

The amount of information management accounting has to identify and analyze each day continues to grow. AI technology can help management accountants to explore the data, increase productivity, improve decision-making, and increase turnover. (Ng & Alarcon 2021, 25.)

According to McKinsey, a management consulting company, AI technologies enhance those production processes in a business that are traditionally dependent on human intuition, experience, and judgment. During their research, McKinsey cooperated with a cement company on the integration of AI technology. The cement company wanted to use AI solutions to install real-time optimizers in the company's core assets, such as the vertical raw mill. To do this, they captured the data from vertical raw mill operation process variables and analyzed it utilizing advanced analytics tools and techniques. McKinsey found that the profits of the cement company increased during the first weeks after AI solution implementation. (Charalambous, Feldmann, Richter & Schmitz 2019.)

3 Research Methods

This is a case study research thesis that uses a qualitative research method. The research design, population, data collection and data analysis methods as well as reliability and relevance are described in this chapter. Phase 1 of the research is related to IQ 1, phase 2 – to IQ 2, and phase 3 is connected to IQs 1, 2, 3, and 4. A visual representation of the research design is shown in figure 7 in the sub-chapter 3.1.

The RQ of this thesis, as stated earlier: What kind of automation solutions are inbuilt/add-ons in the five most popular accounting systems in Finland and how they are implemented?

The RQ was divided into IQs in such a way:

IQ 1. Which robotic process automation (RPA) and/or artificial intelligence (AI) solutions are inbuilt/add-ons in the accounting software and which transaction cycle they are part of?

IQ 2. What are the requirements for implementing RPA and/or AI solutions in the accounting software?

IQ 3. What expertise and competencies does the company need to implement RPA and/or AI in the accounting software?

IQ 4. How are the accounting software companies planning to develop RPA and/or AI solutions further?

3.1 Research Design

This is an embedded (with multiple units of analysis), single-case study research, that is comparable to a single experiment (Yin 2018, 49-52.) The research type is empirical research. The research method used is the qualitative case study. This research answers the questions which, how and what.

As stated by Schramm,

“The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result” (Yin 2018, 14).

In a case study, the focus is on investigating a specific case or people in a given environment employing different methods and data. The case study may be an individual, a company or an organization of another kind, an ethnic or social group, an event, or a geographically limited area. This kind of research is often carried out by comparing cases if there is more than one.

The research design is the logical sequence that links the empirical data to research questions and then to research conclusions (Yin 2018, 26). Therefore, the research design is an essential part of the thesis because it assists in guiding the research and drawing conclusions. Phase 1 of this research is related to IQ 1 and uses accounting software as the data source. The data collection method is a case study because there are different accounting software related to one study this thesis is aiming to research. Accounting software and its characteristics are then compared to each other. Phase 2 is related to IQ 2 and focuses on information from the web pages of accounting software providers. The desktop research is the data collection method and comparative qualitative analysis of the information obtained is the data analysis method in phase 2. Phase 3 is connected with IQ 1, IQ 2, IQ 3, and IQ 4 and concentrates on software providers as the data source. The data collection method in phase 3 is an unstructured interview and the data analysis method is a narrative qualitative analysis of interviews. The research design of the thesis is shown in figure 7.

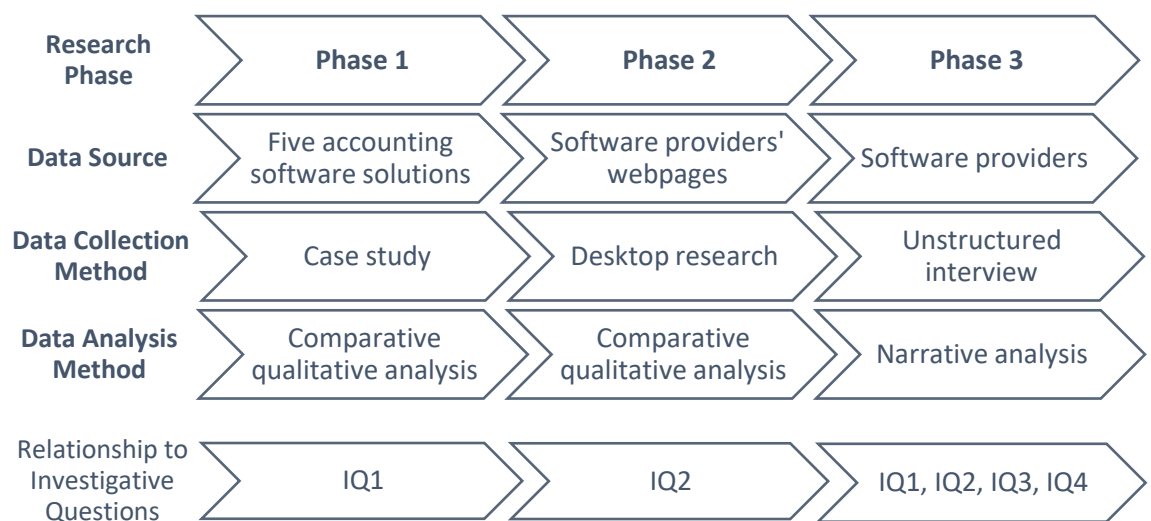


Figure 7. Research design

3.2 Population and Data Collection

Qualitative research helps to explore and understand the meaning that is assigned to a social or human problem (Creswell & Creswell 2018, 41). Therefore, qualitative methods research was used as a data collection choice in this research. In the thesis, the author understands, describes, and interprets the research case and answers the research question. A case study of five accounting software, desktop research of five accounting software webpages, and unstructured interviews are data collection methods used in this thesis.

A case study is an empirical method that investigates a real-world phenomenon in-depth and relies on multiple sources of evidence. (Yin 2018, 15.) There are many sources the case study evidence can come from, including documentation, archival records, interviews, direct observations, participant observation, and physical artifacts (Yin 2018, 110). A physical artifact is, for example, a technological device, a tool, or some other physical evidence that can be observed as part of a case study research. (Yin 2018, 125.) In this thesis, physical artifacts are accounting software, that are important to analyze in order to draw own external conclusions about the nature of the actual use of the accounting programs. The evidence of the research is found through documentation (formal studies related to the case), physical artifacts, and unstructured interviews.

As it was mentioned, one of the sources of evidence in this case study is the interview. In a case study, interviews represent guided conversations rather than structured queries. This type of interview is usually called an unstructured interview. (Yin 2018, 118.) Many case study interviews may take only about one hour or so. These interviews are still open-ended and done conversationally. Although the major purpose of the interview is to corroborate previously established findings (those that come from the documentation and physical artifacts), there are also topics of an open-ended nature that could be asked during an interview. (Yin 2018, 119.) Therefore, an unstructured interview conducted more like a conversation was perfectly suitable for this research.

The author decided to analyze accounting software first (to collect data from websites) and after that conduct interviews with software providers to get confirmations or discover more about what was found. Therefore, the author's own analysis helped to collect data to answer IQ 1 and IQ 2. Interviews were conducted to collect further information and confirm what was discovered in IQ 1 and IQ 2 as well as to answer IQ 3 and IQ 4. Because while using accounting software it is not possible to see in which transaction cycle the automation, RPA, and AI are used, there was no necessity to test accounting software. Thus, initial data was collected from accounting software official websites including customer support forums, and through interviews.

Interview questions were drafted before the collection of information has been started but the final version of questions was ready after the comparative analysis of accounting software has been completed. In total there were nineteen questions related to the research IQs. They were written so that they could help to answer the main objective of the thesis. IQ 1 included the first seven interview questions, IQ 2 – the next six interview questions, IQ 3 – two following interview questions, and IQ 4 – the last four interview questions. Interview questions are added in appendix 1.

When information from the websites was gathered, the data collection continued with the arrangement of interviews. Emails were sent to product managers (Procountor, Visma Fivaldi, Netvisor, Fennoa) and to the head of education (Asteri) with a copy of the email sent to their sales departments. These recipients were considered as the right source of the information because of the specifics of their jobs. Emails that were sent to respondents contained the information about the author of the thesis and the aim of the research, presented the commissioning company and included the link to the Haaga-Helia RDI project.

Procountor and Asteri representatives accepted the interview invitation. Fennoa representative considered participating but after the familiarization with the interview questions they refused. Visma Fivaldi and Netvisor did not reply to interview requests. Procountor representative agreed to make an interview through the Microsoft Teams meeting while Asteri representative suggested conducting it face-to-face. It was decided to ask interviewees the permission to record interviews. Thus, it was easy to obtain interview transcripts afterwards. Microsoft Teams can convert talk to a text transcript while recording a video. For the face-to-face interview the author used the digital voice recorder, and the text transcript was done via the Microsoft 365 online version of Word document. The data collection method used was an unstructured interview which means that interviews were done in a conversational way with additional questions occurred during interviews. Both conducted interviews lasted 30 minutes and this time was enough to get all the needed information. The number of transcribed pages was almost the same: 16 Word pages (Procountor) and 15 Word pages (Asteri). The overview of how data was collected is presented in table 3 below.

Table 3. Overview of data collection

Software	Methods to collect data	Position of interviewee	Interview location	Interview duration	Number of transcribed pages
Procountor	Website information and interview	Product manager	MS Teams meeting	30 min	16
Visma Fivaldi	Website information	-	-	-	-
Netvisor	Website information	-	-	-	-
Fennoa	Website information	-	-	-	-
Asteri	Website information and interview	Head of education	Face-to-face	30 min	15

3.3 Data Analysis Methods

Data collected through the case study method can be analyzed by looking into commonalities and differences in the cases in question. (Ghauri, Grønhaug & Strange 2020, 142.) That is, in this research the characteristics of five accounting software were analyzed by comparing them with each other.

According to Yin (2018, 131), qualitative data analysis software (CAQDAS) or such tools as Word or Excel can be used in order to organize the narrative and quantitative data. But whether using or not the computer-assisted software, the data must be observed and manipulated in a way that it is possible to find patterns, insights, or promising concepts. Other ways of “playing” with the data can include, for example, the creation of visual displays – flowcharts and graphics, tabulation of the frequency of various events, and putting information in sequence. (Yin 2018, 167.) As mentioned earlier, in this research the data from different interviews were compared with each other.

When interviews data is collected it needs to be analyzed. Because the amount of the transcribed text can be large, it needs to be dissected, reduced, sorted, and reconstituted. The components in qualitative data analysis, therefore, include 1) data reduction, 2) data display, 3) conclusion drawing, and verification. Data reduction is the process of selecting, focusing, simplifying, and transforming the interview data to create meaning from the words. Data display is an organized collection of information in form of figures, data matrix, among others. To make sense of the collected data, it needs to be interpreted. Interpretation can be more intuitive and subjective when compared to data analysis. (Ghauri & al. 2020, 132-133; 139.)

The analysis started with the information obtained from the accounting software websites. To make it easier to answer IQ 1, an excel table was created during data collection. When required information was found, for example, if there was RPA in the payroll cycle or not, it was added to the Excel table. Additionally, examples of how the accounting software provider described the process that worked with automation, RPA, or AI, were added to the same table as comments to the corresponding cells. This made it possible to have all collected information in one place, contribute to the first IQ, find some additional data about software, and detect the transaction cycles that used RPA or/and AI. After when the table was filled in, it was easy to see the commonalities and differences and interpret them. Figure 8 shows a screenshot of the analysis tool itself. Table 4 shown in the subchapter 4.1 is the same table as in figure 8 but in a Word format and includes the collected and analyzed data. This was the way the data from accounting software websites was analyzed to answer IQ 1.

	A	B	C	D	E	F	G	H
1			IQ 1. Which robotic process automation (RPA) and/or artificial intelligence (AI) solutions are inbuilt/add-ons in the accounting software and which transaction cycle they are part of?					
2								
3								
4			Comparative Qualitative Analysis of Five Accounting Software					
5								
6		No	Software	Procountor	Visma Fivaldi	Netvisor	Fennoa	Asteri
7				1	2	3	4	5
8			1 RPA/AI in the Revenue Cycle					
9			2 RPA/AI in the Expenditure Cycle					
10			3 RPA/AI in the HRM / Payroll Cycle					
11			4 Integration with third-party applications (yes, no)					
12			5 Cloud-based or installed					
13			6 Mobile app (yes, no)					
14			7 Monitoring of working time and absences (yes, no)					
15			8 Fast manual entry of receipts via app (yes, no)					
16			9 A multilingual website (yes, no)					

Figure 8. Screenshot of the analysis tool

After when own comparative qualitative analysis of five accounting software was completed, it was time to start examining the interviews. To do that, each recorded interview audio file was transcribed into text. The text was then reduced from the unnecessary information (for example, from greetings and farewells) and sorted according to each investigative question (IQ). The most relevant data, i.e., in which transaction cycles RPA and/or AI were used, which in this example was related to the IQ 1, was added to a separate table in Word. This assisted with identifying similarities and differences in the accounting software and was useful when answering each of the following IQs and when drawing conclusions. This table was then divided into smaller tables and added under relevant results subchapters for visualization purposes.

3.4 Reliability and Relevance

Reliability and relevance were ensured through four principles of data collection by Yin (2018, 126-137):

- Use multiple sources of evidence
- Create a case study database
- Maintain a chain of evidence
- Exercise care when using data from social media sources

The use of multiple sources of evidence in this thesis was ensured through documentation (different sources related to the case study), physical artifacts (accounting software), and interviews with accounting software providers. The case study database was created with the help of own notes and tabular and narrative material as a result of interviews, accounting software website observations and examinations, and accounting software analysis. In this research, the chain of evidence was maintained through tabular and narrative materials referring to interviews with the time and place of an interview. Interviews were linked to and answered the case study questions. Care was exercised

when using data from social media sources, for example, by doing a cross-check of the used sources.

During the initial data collection, it was noticed that software providers sometimes mentioned RPA or robots when they were referring to automation. Or they introduced their solutions as automation even though they meant AI or/and RPA. For example, a software provider could write on the website that there was automation or robot in the software, and that the automation or robot was able to train itself using existing data. It is obvious that they were considering AI in this case. Thereby, it was essential to have a clear understanding of what was meant by automation, RPA, and AI. Fortunately, these automation solutions could be distinguished from each other if there was a description of the process on the website, an example of it, or if the software provider could provide additional information on them. Also, the information was provided and/or confirmed through interviews.

4 Results

The results chapter contains the author's own analysis of five accounting software as well as an outcome of interviews with accounting software providers. The research question (RQ) of the thesis was to discover what kind of automation solutions were inbuilt/added-on in the five most popular accounting systems in Finland and how they were implemented.

To answer the RQ, it was split into four investigative questions (IQs) in this way:

IQ 1. Which robotic process automation (RPA) and/or artificial intelligence (AI) solutions are inbuilt/add-ons in the accounting software and which transaction cycle they are part of?

IQ 2. What are the requirements for implementing RPA and/or AI solutions in the accounting software?

IQ 3. What expertise and competencies does the company need to implement RPA and/or AI in the accounting software?

IQ 4. How are the accounting software companies planning to develop RPA and/or AI solutions further?

Each sub-chapter of the results chapter contains answers to related IQs as it was shown in the overlay matrix (table 1). The answer to IQ 1 is included in subchapter 4.1, the answer to IQ 2 – in subchapter 4.2, the answer to IQ 3 – in subchapter 4.3, and the answer to IQ 4 – in subchapter 4.4. The author's own comparative analysis of accounting software is shown in table 4. Table 5 contains the summary of replies and confirmations from accounting software providers about RPA and AI solutions in the transaction cycles of their software. Figure 9 shows RPA & AI solutions (either inbuilt or add-on) in five accounting software. Figure 10 and figure 11 illustrate Procountor and Asteri RPA and AI solutions' development planning.

4.1 RPA and AI Solutions in the Transaction Cycles of Accounting Software

The following details were gathered from five accounting software official web pages. The results are written in the way that each paragraph has the summarised information related to one accounting software. This analysis ends with table 4 which provides a visual grouping of all the information related to comparative analysis in IQ 1. The results of the interviews with software providers follow the results of the comparative analysis.

Procountor is the first most popular and cloud-based accounting software in Finland with a multilingual website that also has a mobile application for strong authentication. There is a possibility to upload receipts to expense invoices via a mobile application called

Procountor Mini. Procountor cannot monitor working hours and absences without the integration of third-party applications. The software can be integrated with third-party applications, for example with a data visualization program Power BI. In the revenue cycle, Procountor uses automation with the solution called “Jackbot”. “Jackbot” assists in the sales invoice processing, including, for example, payment reminders to the customer. In the expenditure cycle, Procountor has an inbuilt AI called “Procountor Junior”. It is possible to use “Procountor Junior” in purchase invoice processing. In the payroll cycle, the user has automation with “Jackbot” which can help with holiday calculations, for example. (Procountor 2022.)

Visma Fivaldi is the second most popular and cloud-based accounting software in Finland that can be integrated with many of its own or third-party solutions. It has a mobile app, a receipt attachment feature, and can monitor absences and working time. The website works in many different languages. In the revenue cycle of Visma Fivaldi, there is a possibility to add RPA. There is also an inbuilt AI called “FabricAI” which is used, for example, for unpaid sales invoice reminders, and debt collection via a debt collection company, among others. The author’s opinion is that Visma Fivaldi has automation throughout the revenue cycle. In the expenditure cycle, according to the information Visma Fivaldi gives, there are both RPA and AI “FabricAI” solutions. Visma Fivaldi utilizes 95% automation with AI in the purchase invoice processing. In the payroll cycle, there is RPA with automatic notifications, for example, to the income register. (Visma Fivaldi 2022.)

Netvisor is the third most popular cloud-based accounting software in Finland that can be integrated with such solutions as Finazilla for budgeting and Odoo for business management. It has a mobile app and can monitor the working hours and absences of the user. The user cannot enter receipts via the mobile app. The website works in Finnish, English, and Swedish. In the revenue cycle, there is added RPA automation for recurring sales invoices and credit memos. In the expenditure cycle, Netvisor has both RPA and inbuilt free AI “FabricAI”. (Netvisor 2022; FabricAI 2020a.) Netvisor is trying to shift from automation to the full usage of RPA and AI. In the payroll cycle, there is an inbuilt RPA that assists in sending automatic notifications to the income register, among other things. It was not possible to confirm all these findings through the interview with Netvisor, although they give a lot of information via their website. For example, on the website, Netvisor mentions that in the expenditure cycle, RPA and AI provide a user with pre-filled invoice templates based on historical data. The invoice can be then accepted or rejected by the user. Thus, the user also teaches RPA and AI new information. (Netvisor 2022.)

Fennoa is the fourth most famous cloud-based accounting software in Finland with a mobile app and the possibility to attach receipts to purchase invoices. The user can also monitor their own working time and absences. The website works only in Finnish. Fennoa can be integrated for example with user company webshops, Enterprise Resource Planning (ERP), and Customer Relationship Management (CRM) systems. In the revenue cycle, Fennoa has an inbuilt RPA called “Fennoa Robotti”. RPA retrieves the Single Euro Payments Area (SEPA) payments from a bank and posts them into correct accounts. “Fennoa Robotti” is also used in the expenditure cycle for recurring purchase invoices (processing, approval, and payment). (Fennoa 2021.) It is likely that Fennoa also uses or will start to use AI solutions in the purchase invoice processing in the nearest future. Software design and manufacturing company FabricAI Oy informs about cooperation with Fennoa through their official web pages, although Fennoa does not confirm it via their own website. (FabricAI 2022b.) In the payroll cycle “Fennoa Robotti” helps to prepare and submit the employer’s separate report to the income register. (Fennoa 2021.)

The fifth most popular accounting software in Finland, **Asteri**, has both cloud-based and installed versions. Asteri can be integrated with such applications as Apix online invoicing or other accounting software. There is no information about the mobile application on the website, but Asteri users can keep a record of their working hours and absences in the software. The website operates in the Finnish language. Asteri has features that work partially as RPA in the recurring events. RPA can be applied to the revenue, expenditure, and HRM/Payroll cycles. (Asteri 2022.)

Table 4. Comparative qualitative analysis of five accounting software

No	Software Features	Procountor	Visma Fivaldi	Netvisor	Fennoa	Asteri
1	RPA/AI in the revenue cycle	Automation with “Jackbot”	RPA & AI “FabricAI”	RPA	PRA “Fennoa Robotti”	RPA
2	RPA/AI in the expenditure cycle	AI “Procountor Junior”	RPA & AI “FabricAI”	RPA & AI “FabricAI”	PRA “Fennoa Robotti”	RPA
3	RPA/AI in the HRM / Payroll cycle	Automation with “Jackbot”	RPA	RPA	PRA “Fennoa Robotti”	RPA
4	Integration with third-party applications	Yes	Yes	Yes	Yes	Yes
5	Cloud-based or installed	Cloud	Cloud	Cloud	Cloud	Cloud + installed
6	Mobile app	Yes	Yes	Yes	Yes	No
7	Monitoring of working time and absences	No	Yes	Yes	Yes	Yes

No	Software Features	Procountor	Visma Fivaldi	Netvisor	Fennoa	Asteri
8	Fast manual entry of receipts via app	Yes	Yes	No	Yes	No
9	A multilingual website	Yes	Yes	Yes	No	No

The results of the interviews with Procountor and Asteri are written below. The summary of the interviews is shown in table 5. Because Visma Fivaldi, Netvisor, and Fennoa did not agree to conduct interviews, the table is not filled in with the information regarding all accounting software.

Interviews with Procountor and Asteri representatives extended the knowledge of the RPA and AI solutions used in various transaction cycles of these accounting software. In particular, **Procountor** uses neither RPA nor AI in the revenue and HRM/Payroll cycles, rather works it in these transaction cycles with inbuilt automation and allows to arrange default settings. In the expenditure cycle in the purchase invoice processing, Procountor utilizes AI and machine learning. AI is inbuilt into the software, and it is free of charge for the users. Procountor has an onboarding tool that assists users when an AI solution becomes available. This tool includes instructions on how to start using a new AI solution. The user of the software can decide whether to apply it or not. Purchase invoice processing with AI works in Procountor as follows: 1) purchase invoice comes to the accounting software, 2) AI takes information from the invoice, and 3) through machine learning makes correct accounting entries based on previous invoices. AI also manages the VAT reporting.

Asteri providers identify customers' needs and give instructions to program the software in a way it is comfortable for them to use it. There is little AI in the software because Asteri concentrates mostly on inbuilt RPA solutions which can be implemented in all the transaction cycles. For example, a user can upload documents in PDF or CSV format and the software will automatically make accounting entries. After that, the user can add some AI if needed. Asteri works in such a way that customers buy it for basic accounting, but additional solutions (licenses) come at an extra cost.

Table 5. RPA & AI solutions in the transaction cycles of five accounting software

No	Software Features	Procountor	Visma Fivaldi	Netvisor	Fennoa	Asteri
1	Revenue cycle	Automation	-	-	-	RPA
2	Expenditure cycle	AI	-	-	-	RPA
3	HRM/Payroll cycle	Automation	-	-	-	RPA

In conclusion, it can be stated that five accounting software have a cloud-based version of the program. Three out of five (Procountor, Visma Fivaldi, and Netvisor) have multilingual websites. RPA is either inbuilt (Fennoa, Asteri) or can be added to the software (Visma Fivaldi, Netvisor), or there is no RPA at all (Procountor). AI is inbuilt in the expenditure cycle of four out of five accounting software (exception – Asteri which works mostly on RPA). Visma Fivaldi, Netvisor and Fennoa are using (Fennoa is using or will be using) the same AI called FabricAI. The users of these five software can decide whether they want to use RPA or/and AI solutions or not even if these solutions already exist as a part of each of the software. All five software can be integrated with other applications to increase their productivity and user-friendliness. The summarised information on RPA and AI solutions (inbuilt or add-on) is shown in figure 9.

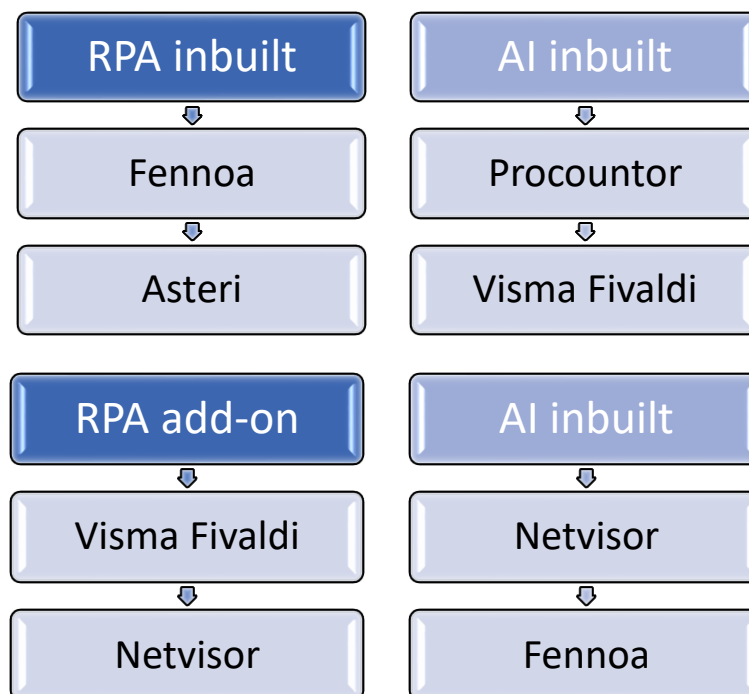


Figure 9. RPA & AI solutions in five accounting software

4.2 Requirements for RPA and AI Solutions Implementation

Answers to IQ 2 are written so that the reader is introduced to the information from accounting software web pages first and then after that – to the results of interviews with accounting software providers. Visma Fivaldi, Netvisor, and Fennoa's results do not include interview results.

Procountor's official website has the information on what are the requirements to enable AI (Procountor Junior), including where and how it can be enabled as well as the recommendations on when AI is worth being enabled. The customer has to enable AI using the given instructions from the Finnish version of Procountor. Among requirements,

there are fifty approved purchase invoices within one year with at least moderate expected accuracy for postings. In case the user of Procountor has default postings, then there will not be a lot of help from Procountor Junior. (Procountor 2022.)

During the interview, it was found that Procountor has two types of customers as said by its representative: accounting professionals/accounting offices and business enterprises. For different customers, there are different benefits to using AI solutions. In the case of accounting professionals, AI solutions help to focus users' attention on important things, and therefore they have more time for other activities. For example, accountants can earn more revenues while providing additional consulting services for their customers. However, it takes time for AI to learn, and therefore accountants need to make sure that the outcome (actual postings) is correct. Companies that use AI solutions, on the other hand, have the latest information from financial reporting which then assists in improving the company's financial situation. To implement and use Procountor AI solutions successfully, the company has to have at least fifty correctly posted/checked purchase invoices within a year. AI is constantly learning which means that it takes data from subsequent purchase invoices immediately and improves its own productivity.

On the website, it is mentioned that the application of AI will add many benefits to **Visma Fivaldi**, i.e., reducing the manual work of accountants. Visma Fivaldi offers expert help to its customers if they want to start using AI because AI can be considered a complicated feature for some customers to start working with. Future and present users of the software can contact specialists from Visma Fivaldi to get a consultation time but no specific requirements for starting using AI were found on the webpage. Regarding RPA there are no requirements mentioned on their website. (Visma Fivaldi 2022.)

Netvisor's webpage says that AI can be activated or/and deactivated by users themselves through the accounting software. The deployment of AI does not require any changes in Netvisor. AI then starts collecting information from the previous purchase invoices from a period of a maximum of one year. There are not any other requirements for the deployment of AI and RPA were found. (Netvisor 2022; FabricAI 2020a.)

Fennoa has three guidebooks for users on their website: 1) guide to building a functioning digital finance process, 2) guide for those who are considering changing the accounting system, and 3) guide on the reasons to automate one's financial services. Through these guides Fennoa recommends users define the needs of the company and discover how the accounting system works before purchasing it. Fennoa mentions that Fennoa Robotti can be taught according to the needs of the user through a set of predetermined rules. Fennoa does not mention any requirement to start using AI solutions. (Fennoa 2021.)

On **Asteri's** website, there are instructions on how to use shortcut keys and accelerate accounting software users' work. Asteri promises that by learning and implementing all of them the accounting software will work as the RPA technology. The website has a very extensive data bank where the user can find information about the software and its additional solutions. (Asteri 2022.)

According to an Asteri representative, the benefits and drawbacks of implementing and using RPA and AI depend on the nature and needs of the user. Organizations from various industry sectors choose accounting software depending on their size and business aims. Some organizations still prefer manual work, others use RPA and AI for most of the accounting processes. One of the disadvantages of deploying AI is that if AI was taught wrongly, it can cause a lot of harm to an organization. AI starts learning from the second invoice if the format of the invoice is the same, but if the invoice is with a different format or quality, it will take more time. Another interesting comment about AI relates to its continuous utilization. The operator of the software gets used to it and does not pay attention to how accounting processes work. In case of issues, it will take more time to solve them. The successful implementation of RPA and AI also depends on the quality of invoices. Asteri can provide services for most organizations and if there is something they do not know, integration with other software solves the issue. The faster users learn how to work with RPA and AI, the better outcome they will achieve. It can take from a couple of months to a "never learn" situation. Asteri provides customers with user manuals, so it is easier to start using the software.

To summarize, both Procountor and Asteri agreed that in order to use AI successfully AI needs to be taught correctly from the beginning, but Procountor requires a minimum of fifty checked invoices within one year. Asteri, on the other hand, does not see a high number of invoices as a requirement and worries that if the entered information is not correct, AI becomes mistrained, which may cause harm to the whole accounting cycle. Procountor works mostly with AI and does not use RPA in the accounting software. Asteri, on the contrary, adds more effort to implementing RPA because of the control a user has over the process. Visma Fivaldi, Netvisor and Fennoa websites do not have much information about the requirements to deploy their solutions. Visma Fivaldi rather offers consultation with their experts, Netvisor writes that users can apply those themselves while using the software, and Fennoa does not specify the requirements at all.

4.3 Expertise and Competencies for RPA and AI Solutions Implementation

Answers related to IQ 3 were collected through interviews that were performed with two accounting software representatives that agreed to conduct interviews: Procountor and Asteri.

During the interview with Procountor representative it was confirmed that no additional skills or competencies are required to implement and start using AI solutions in **Procountor**. The only factor that needed to be considered is whether the company or/and accounting office decides it is necessary and productive to start using it. Some organizations prefer to use part of the solutions or not use them at all. For example, micro-enterprises or organizations that do not make purchases very often will not probably use AI solutions when using Procountor.

As per an interview with **Asteri**, when an organization decides to implement RPA or/and AI solutions, they need to understand their industry, consider organization size, and the ability to learn new technologies. Then, with software documentation including educational videos from Asteri, they can learn to use the software and various solutions. The software representative believes that RPA can add more value to managing accounting processes than AI. There is not much for AI to do/learn from if it receives documents of the same format and/or same content.

Consequently, as explained by Procountor representative, any of their customers can start using AI with the help of their guidelines without specific skills from the user. However, an organization should determine beforehand whether it is necessary to use AI in the purchase invoice processing or if it is preferable to do things manually. Asteri software can be used without any additional solutions as well, but if an organization needs them, then Asteri representative advises considering the ability to learn new technologies. Because Asteri works mainly on RPA, RPA can be applied to any of its processes with the help of different documentation and explanatory videos Asteri provides.

4.4 Plans for Developing RPA and AI Solutions Further

This sub-chapter has answers to IQ 4 which aimed to determine the plans of accounting software providers regarding the future developments of RPA and AI solutions. Results include the information gathered from interviews with Procountor and Asteri representatives.

During the interview, it was learned that **Procountor** cooperates with its customers and machine learning experts to discover what further solutions could be added to the

software or if they are worth adding. Procountor also goes after its competitors and follows trends in accounting. The interviewee would want to see more software components automated because of the manual work that users still do, for example, while checking and correcting accounting entries. AI could be used for the identification of inconsistencies and validation of data in the HRM/Payroll cycle, but this is not the nearest development plan of Procountor. Figure 10 illustrates Procountor development plans regarding RPA and AI solutions.

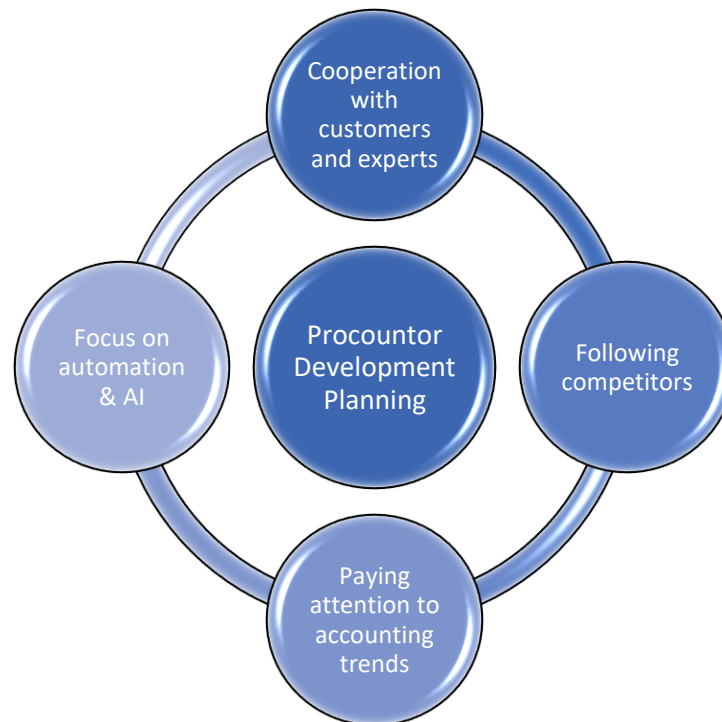


Figure 10. Procountor RPA & AI solutions' development planning

Asteri representative says that the usage of AI will decrease in the future because of the decreased paperwork amount. This is not the company's official opinion but rather the representative's own one. AI is trending nowadays but in the future invoices will come to the accounting system in a well-defined format and will be added to the accounts with the help of RPA. RPA has more advantages because it can be implemented according to the specific needs of the user, i.e., the way he or she thinks about how a process task needed to be executed. It is also faster and allows the user to control the process and change it when needed. Asteri is developed in accordance with Finnish laws and regulations which can change every year. It is important for Asteri providers to listen to their customers as well as to test the software themselves. Thus, they can improve it at regular intervals. The development is mostly focused on the RPA side although the software is perfect enough at the moment. Figure 11 shows Asteri development plans regarding RPA and AI solutions.

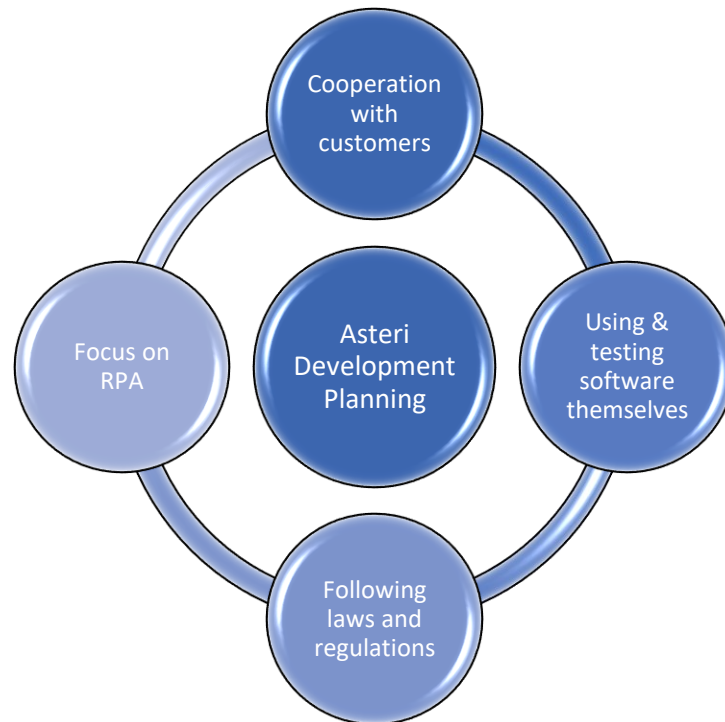


Figure 11. Asteri PRA & AI solutions' development planning

To sum up, both accounting software providers – Procountor and Asteri – work closely with their customers. These accounting software providers want to recognize their customers' needs to provide them with better services and solutions. Procountor monitors its competitors, cooperates with experts, and follows accounting trends while Asteri is oriented to work in accordance with Finnish laws and regulations. Procountor representative believes in the benefits and distribution of usage more automation and AI in the future, but Asteri representative is certain that RPA has more advantages and chances to become widespread among the users than AI.

5 Discussion

The discussion chapter includes key findings, conclusions, and evaluation of the results, as well as recommendations and suggestions for further research. The overall evaluation of the thesis process and own learning is also added to the discussion chapter.

The main objective of the research was to investigate the automation solutions of the five most popular accounting software in Finland and their implementation. The research question focused on answering what kind of automation solutions were inbuilt/added on in the five most popular accounting systems and how they were implemented.

Respectively, the research question (RQ) was divided into investigative questions (IQs):

IQ 1. Which robotic process automation (RPA) and/or artificial intelligence (AI) solutions are inbuilt/add-ons in the accounting software and which transaction cycle they are part of?

IQ 2. What are the requirements for implementing RPA and/or AI solutions in the accounting software?

IQ 3. What expertise and competencies does the company need to implement RPA and/or AI in the accounting software?

IQ 4. How are the accounting software companies planning to develop RPA and/or AI solutions further?

5.1 Key Findings

Inbuilt AI solutions from Procountor include machine learning tools that make processing of purchase invoices easier, faster, and more accurate. There is no RPA but rather an automation in Procountor. AI is used only in the expenditure cycle of the software from Procountor. Asteri is more specialized in using inbuilt RPA solutions and very little AI. RPA can be utilized in all the transaction cycles of Asteri. Visma Fivaldi and Netvisor use the RPA add-on in every of the transaction cycles. Inbuilt AI is used in the expenditure cycle of Netvisor and in both the revenue and expenditure cycles of Visma Fivaldi. Fennoa has inbuilt RPA throughout the transaction cycles and most likely has inbuilt AI in the expenditure cycle. Users of the software can choose if they want to use RPA or/and AI. Unfortunately, it was not possible to confirm findings related to RPA & AI solutions from Visma Fivaldi, Netvisor, and Fennoa providers. Fennoa refused to participate in an interview. Visma Fivaldi and Netvisor, which both operate on the same AI called "FabricAI", did not respond to the interview requests.

Size of the organization, industry sector, and the number of invoices, among others, need to be taken into consideration before deploying RPA or/and AI solutions. For example, if an organization prefers to manage and influence its accounting processes continuously, it should examine accounting software with RPA solutions. Conversely, if an organization has well-defined recurring processes and a high number of invoices monthly, it should look closer at accounting software that uses AI solutions. If the company is a new or a very small one, it can use either of the accounting software and think about additional RPA or/and AI solutions later. Anyhow, the customer company has to know their business very well and should define its goals clearly before purchasing the accounting software.

Usually, an organization does not need to have any special skills or competencies to start using AI or RPA in the accounting software. Accounting software providers equip customers with instructions and educational videos on how to use their solutions. Customer service and consultations are offered as well. A carefully designed business plan will assist customer organizations in doing the right decision and avoiding future regrets of losing money.

Accounting software providers, particularly Procountor and Asteri, work closely with their customers in furtherance of RPA and AI development. Procountor is oriented towards developing AI as they believe AI will be used widely in accounting. Asteri is more interested in providing its customers with RPA solutions because RPA can be used in accordance with each customer's needs. Asteri is acting in accordance with laws and regulations while Procountor is guided by its experts, competitors, and trends in the field.

In conclusion, it can be said that RPA and/or AI are applied in the expenditure cycle of all five analyzed accounting software although they could have been considered in other transaction cycles as well. From the literature review, it was found that all transaction cycles could benefit from the usage of RPA and/or AI but the focus of analyzed accounting software is mostly on the purchase invoice processing (except for one accounting software named Asteri which offers RPA solutions for all the transaction cycles). It was also interesting to ascertain that accounting software providers concentrate more either on RPA or AI but do not consider developing both. Regardless of that, the justifications for using either of the solutions were very accurate and rational. In the end, it was hard to decide which solution is better and/or more suitable for SMEs. It depends very much on the company and the way the company would like to use the accounting software. Therefore, some research or consultation could be worthwhile for organizations before they buy the software.

Requirements, expertise, and competencies for the deployment and use of RPA and/or AI solutions were expectedly low for users. User-friendly software with clear instructions is a must in our competitive world, especially for companies that aim to turn their customers into permanent buyers. The only advice from accounting software providers for their software users would be to know their business processes and discover what exactly they need the automation solution for or if it is needed at all. This suggestion was also covered in the theory part of the research in chapter 2 and appeared to be truthful information.

Plans to develop RPA and/or AI solutions further differed in accordance with what solutions accounting software providers offer at the present time. At least it is true with two accounting software whose representatives were interviewed (Procountor and Asteri). It is highly possible that the development plans of other accounting software are in line with what they already have, for example, if they have AI – it will be developed further, and software providers do not switch to using RPA instead.

The data collected during phase 1 and phase 2 of the research (figure 7 in the subchapter 3.1) was obtained from official websites making this information open to everyone. Interviews with software providers (phase 3 of the research) assisted in confirming the information collected from the official web pages and gave a deeper understanding of the RPA and AI solutions, their deployment and use issues, and accounting software development plans.

5.2 Recommendations and Further Research

The author would recommend the commissioning company do additional research on the price policies of accounting software in order to help SMEs to compare not only automation solutions but also their prices. It was noticed that RPA and/or AI solutions were in some cases included in the price (Procountor 2022), sometimes the user of accounting software must pay for them separately (Asteri 2022), or the price changed according to the number of AI users (Visma Fivaldi 2022).

Also, the author would suggest analyzing the remainder ten accounting software mentioned in the research done by the financial magazine *Tilisanomat* (Lyytinen & Fredman 2021). It would have been interesting to discover which automation solutions the rest of accounting software have and how they plan to develop them in the future. This thesis could be used as a guide when analyzing software.

Another recommendation would be to do research on ethics in AI, i.e., what are the ethical issues in the application of AI in accounting and how to create ethical policies for AI. For

example, the article that was written by Ruby Flanagan, the reporter for Accountancy Daily magazine, says that AI should be implemented in accordance with companies' values and that accountants are the ones who should guide and lead companies on how to apply ethical AI. Accounting professionals know the difference between legal rights and the right actions, the article states. (Flanagan 2021.) This is very reasonable because during the research it was discovered that accounting software providers turn to accounting consulting specialists as well. Then it could be interesting to compare the ethical benefits of using AI and RPA. For example, which of these solutions is more ethical in accounting and why.

5.3 Reflection of Learning

Throughout the thesis process I, as the author of the research, learned how to conduct accurate qualitative research including the choice of data collection and data analysis methods. The research started with the search and review of reliable sources and continued with collecting and analyzing the collected information. The thesis planning course that was implemented into the process of thesis writing was of great help. During this course, the plan for the thesis was completed so that the thesis objective, research question, and investigative questions were prepared. Because this research is part of the Haaga-Helia RDI project, it added value to the thesis process and its results. The aim of the thesis, the research question, and investigative questions were made in cooperation with the commissioning company.

During the thesis process, I learned about the types of transaction cycles in accounting in more detail and how the automation solutions could be implemented to make accounting professionals' work easier and more precise. This is especially beneficial nowadays because many companies use accounting software or at least the services from accountants who use accounting software every day. It was exciting to discover that the work of an accountant can be automated with RPA and that no significant coding knowledge is needed. Also, that AI can imitate humans and learn while examining repetitive tasks done in accounting software. Understanding the difference between RPA and AI solutions in accounting made it clear to me that human accountant cannot and will not be replaced by RPA and AI in the near future. Oppositely, the use of automation solutions will improve accounting reports and therefore assist in company decision-making. I learned that RPA can be implemented in any of the accounting processes the way the user wants, and that RPA is able to mimic human actions. AI, on the other hand, implements its own logic into the processes by imitating human intelligence. Both accounting solutions reduce manual work and it is for the user of the accounting software to decide which of the solution is more useful in his/her work.

Sadly, it was not possible to conduct all five interviews yet the official information from the accounting software websites assisted in finding most of the needed details. Altogether, the research process was interesting, and I was able to answer the research question and submit the thesis report in time. I believe that this case study research will add value to the CIPAS-project the part of which Haaga-Helia University of Applied Sciences is. Another student who is interested in automation solutions in accounting software can repeat the research process by following clear instructions on how to conduct it.

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Appendices

Appendix 1. Interview questions

1. What RPA solutions are available in the accounting software? For example, if there is a robot, what the robot does?
2. What AI solutions are available in the accounting software? For example, if there is an AI, what the AI does?
3. Are these solutions part of the software or are they installed into the software?
4. Do these solutions come at an extra cost?
5. Which (if any) RPA/AI is used when a company sells a product (revenue cycle)?
6. Which (if any) RPA/AI is used when a company purchases a product (expenditure cycle)?
7. Which (if any) RPA/AI is used when a company prepares salaries (HRM and payroll cycle)?
8. What are some of the features of each type of solution? What do they do?
9. What will be the business benefits of implementing and using this change?
10. What are the drawbacks of implementing and using a solution?
11. What are the requirements for successful implementation (size of the company, number of invoices)?
12. How long does it take to implement the solution and to make it work?
13. Can the company execute (add) RPA/AI itself or do they need additional consultation or help?
14. What factors need to be considered when implementing an RPA/AI solution?
15. What are the skills and competencies needed by the company to implement and use RPA/AI in the accounting software?
16. What were the most significant developments in RPA and AI technology in the past few years?
17. Where do you get the ideas for the development of accounting software?
18. How are you developing RPA/AI?
19. What would you want to be developed/automated in the software in the future?