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ROBOTIC PROCESS AUTOMATION IN FINANCIAL CONTROLLING

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Ohjelmistorobotiikka on viime vuosina suosiota kasvattanut automaatioratkaisu, jota hyödynnetään tietotyön rutiininomaisten tehtävien automatisointiin kohtuullisen pienellä panostuksella, vähentäen siten ihmistyöntekijöiden manuaalisiin prosesseihin kuluttamaa aikaa. Tässä pro gradu -tutkielmassa tarkastellaan ohjelmistorobotiikalle soveltuvia prosesseja etenkin kontrollereiden työssä. Kannattavien käyttökohteiden seulomisen lisäksi ohjelmistorobotiikan käyttöönoton edellytyksiä selvitetään. Tutkielman lopussa arvioidaan lisääntyvän automatisaation vaikutusta kontrollereiden työnkuvaan, sekä hahmotellaan ohjelmistorobotiikan lähitulevaisuuden kehityssuuntia. Tutkielman empiirinen osuus on luonteeltaan laadullinen, ja sen aineistonkeruumenetelmänä hyödynnettiin viittä puolistrukturoitua haastattelua ohjelmistorobotiikan taloushallintoon soveltamisen parissa työskennelleiden ammattilaisten kanssa. Haastatteluissa kerätty aineisto analysoitiin sisällönanalyysiä hyödyntäen.

Ohjelmistorobotiikan käyttökohteiksi soveltuu varsinkin tarkasti määritellyt, yksiselitteiset ja toisteiset tehtävät, joissa on suuri volyymi. Kontrollereiden mahdollisesti kohtaamiin, kriteerit täyttäviin taloushallinnon tehtäviin kuuluu esimerkiksi erilaiset täsmäytykset, tietojen siirto kirjanpitojärjestelmistä raportointijärjestelmiin, toimittajatietojen tarkastaminen ennakkoperintärekisteristä, laskuttaminen, sekä asiakasperintä. Ohjelmistorobotiikan hyödyntäminen edellyttää varsinkin hyvää nykyprosessien tuntemusta sekä sen hahmottamista, minkä tyyppisiä prosesseja ohjelmistorobotiikalla voidaan automatisoida. Ohjelmistorobottien kehittämiseen vaadittavaa osaamista voi esimerkiksi ostaa automaatioratkaisuja tarjoavilta IT-yrityksiltä. Kontrollereiden, kuin myös muidenkin tietotyöläisten, kannattaisi perehtyä automaation tarjoamiin mahdollisuuksiin ymmärtääkseen, minkälaisia prosesseja olisi järkevämpää automatisoida manuaalisen suorittamisen sijaan. Ohjelmistorobotiikka on alkanut saamaan yrityksissä jalansijaa vasta viimeisten 6–7 vuoden aikana, joten sen tulevaa vaikutusta kontrollointiprosesseissa on toistaiseksi hankala arvioida. Tietotyön automaatio näyttää joka tapauksessa etenevän vauhdilla, mikä vaikuttaisi merkitsevän analyyttisempaa ja neuvonantavampaa työnkuvaa kontrollereille rutiininomaisten ja toisteisten työtehtävien vähetessä.

Avainsanat: Ohjelmistorobotiikka, RPA, Robotic Process Automation, automaatio, kontrolleri, taloushallinto, digitalisaatio

ABSTRACT

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Robotic Process Automation (RPA) is an automation solution which has grown in popularity during recent years. It can be used to automate repetitive knowledge work tasks with relatively small development work, thus reducing the time spent by human workers on manual processes. This Master's thesis investigates controlling related tasks, which are suitable for automation with the use of RPA and where its use may prove beneficial. In addition to screening for worthwhile use cases, prerequisites for the introduction of RPA will also be investigated. At the end of the thesis, the effect of increasing automation on the job description of controllers is evaluated, and possible directions of future development for RPA are outlined. A qualitative method was applied for this study; the empirical material was collected using five semi-structured interviews, which were carried out with experts working closely with the development and use of RPA solutions in financial management. Content analysis was then used to analyse the study material.

Good target processes for RPA are particularly well-defined, unambiguous, and repetitive tasks with a large volume. Some financial administration tasks that meet the criteria which controllers may encounter include various data reconciliations, data transfer from accounting systems to reporting systems, checking supplier data from the advance collection register, invoicing, and customer collection. The use of RPA requires especially a good knowledge of current processes and an understanding of which types of processes can be automated with it. The expertise required to develop software robots can, for example, be purchased from IT companies offering automation solutions. Controllers, as with other information workers, should familiarize themselves with the opportunities offered by automation in order to understand what kinds of processes would make more sense to automate instead of performing them manually. RPA has only begun to gain foothold in companies during the last 6-7 years, so its future impact on controlling processes is difficult to assess for the time being. In any case, the automation of information work seems to be progressing rapidly, which seems to signify a more analytical and advisory job description for controllers as time spent on mindless routine and repetitive tasks decrease.

Keywords: Robotic Process Automation, RPA, automation, controller, financial management, digitalization, information work

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1 INTRODUCTION

1.1 Background

The potential use cases for automation are increasing at a rapid pace in digital lines of work, and its effects on working life are no longer limited only to simple physical work tasks. The effects of this type of technological progress are also beginning to become increasingly apparent in highly educated, highly regarded fields of information work, where in the past only humans were deemed capable enough for doing most of the tasks involved.

Around 47% of current job positions in the US have been estimated to be under threat due to automatization during the next one to two decades (Frey & Osborne, 2017). According to a report by Etla (Pajarinen, Rouvinen, & Ekeland, 2015), about a third of Finnish job positions are prone to disappear due to digitalization during the next couple of decades. Especially low-skilled professions are under threat, however digitalization will affect all professions in one way or another, as it already has in many ways. Many professions that require more skill and specialization will become partly automatized as well in the future due to the development of technology-assisted collection, organization and analysis of big data (Pajarinen et al., 2015). Pajarinen et al. (2015) estimate that the biggest upcoming change in the labor market during the next decades will be seen in highly appreciated and sought-after office work, which currently employs a majority of the middle-class in developed countries. Many controlling related tasks and positions can be broadly interpreted as being included in this definition.

Controllers are traditionally defined as management accounting professionals who mainly focus on calculating and keeping an eye on financial figures (A. L. Friedman, 2001; Vaivio & Kokko, 2006). However, modern controllers are usually strategy-oriented business partners who have a deep understanding of various kinds of business activities (Byrne, 2007; Vaivio & Kokko, 2006). Especially the tasks that are close to the traditional view of the controller job

description are at high risk of being automated. For instance, Frey & Osborne (2017) estimate that e.g., the work of accountants and auditors is also computerizable with a very high probability. According to Kokina & Davenport (2017), auditing is an area suitable for automation, and the Big Four auditing companies have begun investing significant sums in analytics and artificial intelligence. Controllers also face various tasks that require a lot of time in terms of data collection and entry, which could already be automated with the use of current technology.

One of the most interesting recent automation technologies that has recently surfaced and gained traction is called Robotic Process Automation (RPA), which is also known as software robotics. In short, a software robot performs predetermined task chains, or processes, automatically. The tasks usually mimic human office work, such as gathering ready-made information from source systems for combining and interpretation purposes. (Mancher, Huff, Grabowski, & Thomas, 2018.) Some examples of core business processes which controllers often face, but could be automated or streamlined using RPA, are: processing of invoices (Harrast, 2020), employee payroll, employee status changes, recruitment and onboarding of new hires, accounts payable and receivable, inventory management and report creation (Madakam, Holmukhe, & Jaiswal, 2019). RPA normally works by utilizing the user interface of existing IT systems to perform tasks just like humans would. Therefore, it does not require changes to existing information systems, so its implementation is relatively simple compared to more complex automation solutions. (Willcocks, Lacity, & Craig, 2015.) However, this technology does not have cognitive abilities like some of the more advanced tools, so it is only suitable for performing simple tasks that follow a clearly defined set of steps and rules that remain relatively unchanged. On another hand, this can be seen as one of the reasons for the attractiveness of software robotics; it can only be used to get rid of the tedious office tasks which require little intellectual effort. It is also a simple enough solution to be feasible with a relatively small investment to development.

1.2 Research question

The technologies created as part of digitalization offer various new tools for many areas of information work, including financial management. Although process automation has been the goal for most companies since the times of Industrial Revolution, in recent years the focus of automation has shifted from factories to office environments. Besides just optimizing physical work, the aim is also to do information work faster and more efficiently than before, which is why new automation technologies such as artificial intelligence, machine learning and RPA are interesting areas for research. For the purpose of this thesis, the topic is limited to RPA, as it is the simplest of the new tools mentioned above, and thus, in addition to being annealed in the media, it is also the easiest to apply to the day-to-day operations of companies.

Although there has been some writing on RPA in recent years, for example in business journals and in the own publications of consulting firms such as Accenture and McKinsey & Company (see e.g., Lhuer, 2016), academic research on the applications of software robotics in the day-to-day work of controllers is still relatively limited. Due to the novelty of the technology, its introduction and applications are also increasing at a rapid pace, so the publications written about it quickly become outdated compared to the current situation in working life. A common issue when discussing new technologies is to deal with them only at a very general level. Therefore, this dissertation explores practical applications where the introduction of software robotics has already been perceived in the business world as generating added value for the company. Studying what RPA could and should be used for, what the perceived benefits it has and what its deployment requires, can provide new perspectives regarding its utilization. In this thesis, the possible benefits of using RPA are examined specifically from the perspective of business operations, which is why the study examines the use of RPA using semi-structured interviews with five professionals from different companies who have dealt with RPA in the context of financial operations. The aim is to better understand the benefits and challenges of implementing RPA through the practical experiences of companies interviewed. The main goal of the dissertation is to answer the following questions in the best possible way with the support of previous literature and empirical material obtained for the purposes of this research:

Main research question:

1. *Which controlling tasks should be automated with the use of* RPA*?*

Sub-questions:

2. *How can a company implement* RPA*?*
3. *How will increasing automation affect the role of financial controllers?*

1.3 Data and method

As the aim of the thesis is to develop an overview of the utilization of RPA in current financial management tasks, qualitative research was chosen as the most suitable approach. Qualitative research describes research that explains properties and qualities, inspecting the meanings people give to things (Hirsjärvi, Remes, & Sajavaara, 2007). The material used in the theoretical part of the thesis is mainly earlier literature on the topic that is available online, such as e-books and peer-reviewed articles. The electronic material used in this thesis was mostly collected using the JYKDOK international e-materials search tool, but Google Scholar was also used on a few occasions. The reason for selecting JYKDOK as the main search tool is that it can be used to easily access various sources of

information using the university login, and the search results can be narrowed down only to include peer-reviewed articles with the full text available online. Different combinations of these keywords and terms were used in finding relevant material: 'Robotic Process Automation', 'RPA', 'accounting', 'controller', 'digitalization', 'computerization', 'fourth industrial revolution'. The theoretical part based on the previous literature is followed by an empirical section, where the overview outlined using earlier literature on the subject is supplemented by a semi-structured research interview addressed to five experts who have worked with applying RPA in financial management. The aim of this procedure was to gather more specific, recent, and experiential answers to the research questions mentioned in the previous paragraph compared to previous literature regarding the topic. The semi-structured interview was chosen as the most appropriate way to implement the collection of research data used in the empirical section, as it allows the interviewees to be guided to present free-form views on the themes to be discussed according to the delineation of the thesis. The interviews were conducted in the form of video calls over the Internet, since it is a method of communication that most office workers have become accustomed to during the COVID-19 pandemic, and it allowed flexible planning of the interview schedules.

1.4 Thesis structure

In addition to this introductory chapter, the structure of this thesis consists of four other main chapters. The second chapter, i.e., the theoretical framework, presents the literature relevant to the research question, which is then used to build the theoretical basis of the thesis. In the second chapter, the reader gets acquainted with RPA in general, as well as the features of its possible applications in the field of financial management. The chapter builds a theoretical basis with the goal of enabling discussion of the main research question. The section compares several different sources of scientific information topic by topic. Metsämuuronen (2006, p. 17) argues that scientific knowledge builds on what has been studied previously, and has been acquired as neutrally and objectively as possible, whilst avoiding subjective statements. The kind of objectivity described by Metsämuuronen (2006, p. 17) has also been the goal while compiling the theoretical framework of this study, which focuses on digitalization, RPA and the tasks controllers face in their work.

The third chapter discusses the research methodology of this thesis. Methodology is a term used to describe the general approach to researching a certain research topic (Metsämuuronen, 2006). The chapter exhibits the research material acquisition method used in more detail along with the chosen research method. The fourth chapter introduces and describes the results of the research by presenting the main findings of the empirical research section. The section briefly describes and classifies the data collected from the interviews and begins the analysis of the research results. In the fifth chapter of the thesis, conclusions are drawn based on the results obtained in the empirical section of this study, along

with relevant earlier research. Finally, the relevance and validity of this study will be assessed, as well as bringing forth ideas and interesting opportunities for further research regarding the topic.

2 THEORETICAL FRAMEWORK

2.1 Digitalization of office work

To get a comprehensive picture of RPA, it is also important to understand the concepts involved and the context in which the development of this innovation has been possible. In the context of this thesis, innovation refers to the development of an idea that serves a need as a value-added, usable service for its user (Rogers, 1998). A good way for others to understand the current change in business is to look at it in a historical context.

Klaus Schwab, founder and chairman of the World Economic Forum, describes that humanity is currently living midst the beginning of the fourth industrial revolution (Schwab, 2016). The first of the industrial revolutions transformed the economy from an agricultural and artisanal economy with the help of hydropower and steam power into an economy dominated by industrial production and mechanical manufacturing. The second revolution took place as oil and electricity further facilitated mass production. The Third Revolution, on the other hand, reflects the time from the 1950s onwards, when the first computers and digital innovations were successfully developed. Right now the world is experiencing the beginning of a fourth industrial revolution, which is built on top of the Third Revolution. (Xu, David, & Kim, 2018.) It is characterized by a fusion that blurs the boundaries between the physical, digital, and biological spheres, as well as the communication of billions of people with each other through digital devices, regardless of their physical location (Schwab, 2016). As the importance of artificial intelligence and equipment grows in the creation of productivity and wealth, the value of human labour will be questioned in its current form in many fields. As the Fourth Industrial Revolution progresses, regions and communities which are open to technological development will be best able to cope with the change it will bring. (Schäfer, 2018.) During the Fourth Industrial Revolution, success requires education suitable for a digital and changing environment, the

rapid adoption of new technologies, and the development of information and communication infrastructure to support the take-up of new technologies. In addition, companies should design strategies that make the best use of these ongoing developments. (Liu, 2017.)

In the Finnish dialogue, however, new technologies in the IT sector are more generally associated under the term digitalisation. The term refers to the comprehensive integration of digital technology into everyday activities. As a result of it, information is now processed, stored, and transmitted mainly through digital devices and computer networks. More broadly, digitalisation is a social process in which the new opportunities created by technological development are fully exploited. (Alasoini, 2015.) By taking advantage of the opportunities of digitalisation, companies are able to increase the efficiency of their operational functions and invest more in their own core competencies by outsourcing some of their operations with the help of technology, among other things (Brands & Holtzblatt, 2015). According to Bolinger (2017), however, technological development can bring not only more efficient existing operations, but also completely new services that cannot even be imagined yet. Digitalisation has also made it possible to develop many new automation tools, which will in turn change numerous industries. It has contributed to the development of RPA, machine learning and artificial intelligence, among other things. (Ilmarinen & Koskela, 2015, p. 53.) The question of which tasks should be automated and what people should do by themselves is by no means new. However, rapid advances in information technology are forcing us to return to this issue constantly, even in various areas that may not have even been considered before. (Bichler, Aalst, & Heinzl, 2018; Bichler et al., 2018.)

The field of managerial accounting, like many other fields, is changing with the new automation technologies mentioned above (Lawson, 2019). In business, these technologies aim to streamline processes previously performed manually by humans. The aim of utilizing new technological means is to make operations easier, faster, cheaper and of higher quality. (Ilmarinen & Koskela, 2015, p. 53.) One of the most significant tools for streamlining operations is robotics, which also includes RPA (Ilmarinen & Koskela, 2015, p. 62). Since the development of automation technologies is inevitable, business professionals such as controllers and managers should focus not only on the elimination of jobs, but also on opportunities which could revolutionize the industry (Bolinger, 2017).

2.2 Transformation of the controller job description

2.2.1 Controller definition

According to Granlund et al. (1997), the title of controller in the Finnish context usually refers to a management accounting professional who oversees the business figures of their profit center, and works as an adviser for the company. Most descriptions of management accounting emphasize its role in providing

accounting information for managerial purposes (Takeda & Boyns, 2014). The most essential task for a controller, according to the definition which is especially commonplace in Finland, is to assist in managerial decisions from a financial viewpoint, and to make sure that the required financial information is available where it is required all around the organization (Granlund & Malmi, 2002). The traditional role of controllers has also been characterized as being the financial historian, corporate watchdog and bookkeeper, whose role has been primarily connected to providing credibility and assurance to the organization's financial processes and the accounting systems which are used to record these processes. The independence of the controller is also something that has been traditionally emphasized, since it reduces the chances of controllers manipulating financial reports in favor of the managers who are accountable for the financial results reported. (Steens, de Bont, & Roozen, 2020.) Some typical controlling responsibilities include budgeting and management reporting, the production and analysis of financial information, and the development of accounting systems (Baldvinsdottir, Burns, Norreklit, & Scapens, 2009).

However, the usage of the title controller differs between regions and organizations. In foreign literature, professionals with similar tasks as many Finnish controllers are often called management accountants. Unlike in Europe, controllers in the United States are usually senior employees who are responsible both for financial accounting as well as management accounting, meaning that they may also have statutory financial reporting responsibilities (Granlund & Lukka, 1998.) The tasks of controllers vary significantly between organizations as well as geographical locations. According to Rouwelaar et al., (2008) the organizational structure, the preferences of management and the industry of the organization also influence the controller's role. Takeda & Boyns (2014) also mention how the management philosophy of the organization has a considerable influence on the selected approach to management accounting. It is also good to keep in mind that the controller's definition is something that has seen much change in the last decades, and as worded by Friedman (2012, 2014), the controller definition continues evolving towards being a more holistic strategic partner, which highlights the collaborative decision-making relationship between controllers and their entity managers.

2.2.2 Common tasks of controllers

Friedman & Lyne (1997) describe that the traditional controlling role mostly includes mechanical tasks, while Vaivio & Kokko (2006) see monitoring business figures as an essential part of the traditional controller stereotype. Examples of specific controlling tasks are planning and managing internal cost operations, measuring financial performance, preparing financial statement information, and participating in strategic cost management (Brands & Holtzblatt, 2015). Supporting and participating in decision-making, having a deep knowledge of business functions, managing risks and participating in change management have however also become critical parts of the work of many controllers today (Byrne, 2007; Granlund et al., 1997; Vaivio & Kokko, 2006). Baldvinsdottir et al. (2009, p.

34) describe the modern controller as a management accounting professional, whose primary function is to provide key information for decision-making, thereby improving an organization's performance and profitability.

Some of the specific skills expected from a modern controller are the ability to think critically and to manage large amounts of information, the latter being especially important in the midst of the information flood that surrounds many controllers today (Pickard & Cokins, 2015). As with most office jobs today, controllers should also have sufficient technical know-how to be able to use the information systems that are required in their work effectively. Microsoft Office tools, especially Microsoft Excel, come up the most often in applications mentioned that modern controllers should know how to use. However, the information processed in Excel is usually from one, if not many, enterprise resource planning (ERP) systems that the company uses. This means that the controller should ideally also have a deep understanding on how to use the company's ERP systems, how the ERP manages data and how different subsystems work together, and where to find the relevant data for performing specific tasks. (Spraakman, O'Grady, Askarany, & Akroyd, 2015.) These tasks may include e.g., exporting key metrics from the system for analysing actual financial figures, recognizing revenue for projects, or calculating and allocating working hours costs for specific departments.

2.2.3 Transformation of the controller's role

The changes that the role of controllers has experienced has been a subject of interest for various studies in the last decades. Most of the research regarding the role of controllers has focused on the shift in the controller's role from being just a "bean counter" into becoming a strategic supporter for the company's management. The results of the studies are however a bit contradictory, as some studies confirm a shift in the role from an accountant of sorts into a more business development-oriented direction, while other studies still see the role of controllers in a more traditional view. There are also so-called hybrid controllers in some organizations, whose role is a mix of bean counters and business partners. (De Loo, Verstegen, & Swagerman, 2011.) This further corroborates the argument that the role of a specific controller is highly dependent on the organization where they are working.

Although management accounting has become more involved in planning the strategy of a company, the information produced is still mainly descriptive and diagnostic. Appelbaum et al. (2017) argue that in the end, the role of managerial accounting has not changed as much as some studies would describe, since most of the work of controllers still consists of composing descriptive analyses, some predictions and analysis that has only a marginal effect on decision-making. According to Lawson (2019), the industry should move further than this to produce more proactive, guided, and situational analytics as well.

Automation is one enabler which has a lot of potential to facilitate this change in the role of controllers by replacing routine tasks and emphasizing the

tasks which require a higher level of thinking. In essence, the roles would be changed from a data collector, processor, analyser and disseminator to having a primary emphasis on the evaluation component of the procedures. (Moffitt, Rozario, & Vasarhelyi, 2018.) Nowadays financial functions are indeed shifting from traditional day-to-day operational tasks to a more strategic and value-creating direction. Their new responsibilities include more than just improving business understanding and acting as a strategic business partner. Over time, the job description of financial management professionals will shift even further from repetitive routine tasks such as invoicing, reporting, and accounting, to tasks such as evaluating, analysing, and interpreting information. (Lawson, 2019.)

It may be a good idea for companies to have some sort of action plan to ensure a smooth transition in the change of these roles. As we move more and more towards the combination of automatic and manual work, some of the various issues which should be considered include ensuring the reliability of automatically generated data, and the privacy and security of new tools. (Moffitt et al., 2018.) The ability to process significantly larger amounts of data also brings new opportunities with it that may change competition in the industry. The digitalisation of society creates a significant number of new needs, which are important to meet by emphasizing the development of the skills needed by the workforce in a changing situation. (Pajarinen et al., 2015.) Both business students and professionals already in employment should keep abreast of the direction in which the industry is developing, as many current financial tasks such as accounting and auditing are estimated to be highly likely to be automated in the coming years (Frey & Osborne, 2017). After all, one of the most common performance indicators that is also used in RPA development estimates how many full-time employees (FTE) were responsible for the previous work input that e.g. the robot replaced (Moffitt et al., 2018). However, for industry players with the right perspective and innovative mindset, exponential technological development may open up a world of opportunities instead of mere images of threats (Bolinger, 2017).

2.3 Robotic process automation

2.3.1 Definition

Robotics refers to the design, construction, and operation of machines, robots, that are used to perform tasks traditionally performed manually by humans. Robotics is commonly used especially for performing simple and repetitive tasks. (Encyclopaedia Britannica, 2020.) Robotic Process Automation (RPA), on the other hand, refers to computer programs that use predefined rules and procedures to perform processes, functions, or tasks independently (IEEE 2017). It is

an umbrella term for tools that operate in human-like user interfaces the same way a human would (Bichler et al., 2018). According to Willcocks, a professor of technology, work and globalization at the London School of Economics, the job description of a knowledge worker working in average support functions includes a lot of repetitive, grim, and uninteresting routine tasks such as handling invoices and exporting reports. RPA is software that provides a solution to humans having to do these various uninteresting processes by performing them independently, imitating how a human would perform them. (Lhuer, 2016.) At their simplest, RPA tools execute the "if-then-else" conditional statements for structured data, as described in the below process chart.

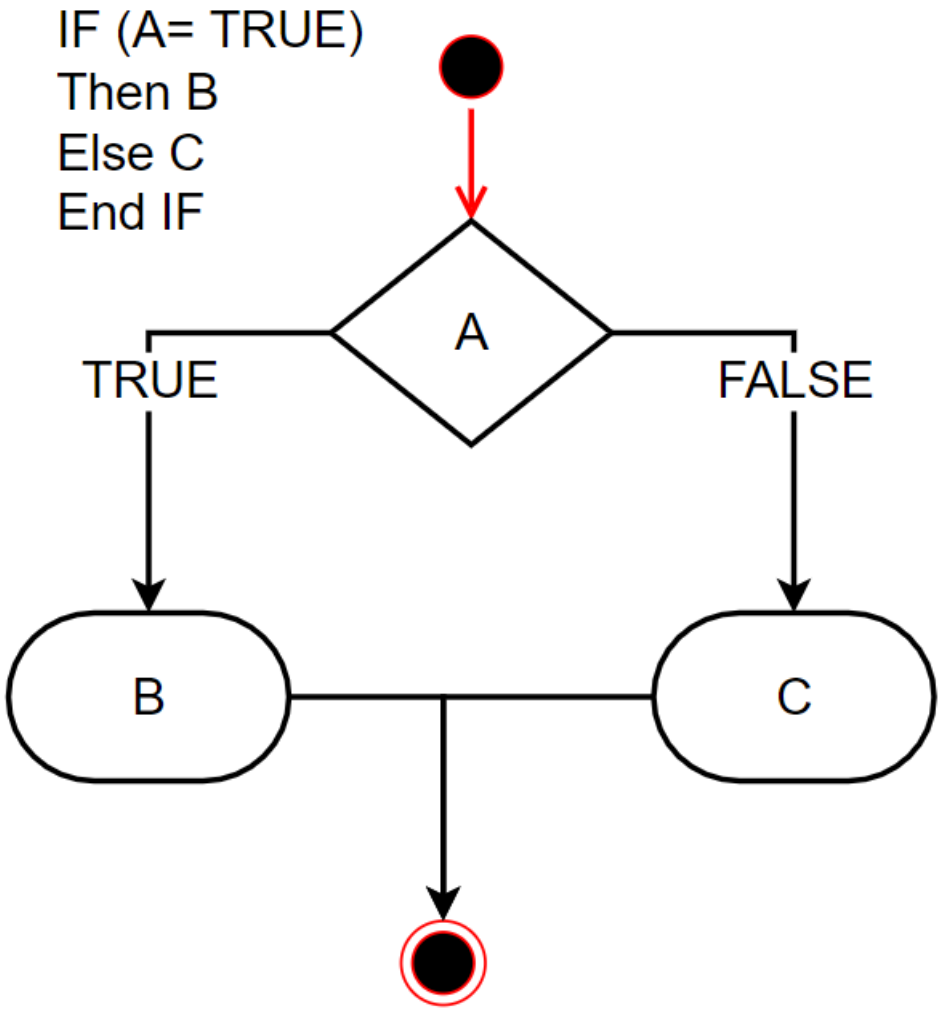

FIGURE 1 "If-then-else" process chart

RPA is seen to be based on three previous technologies: artificial intelligence, screen scraping, i.e., translating information displayed on a screen into machine-readable form, and information retrieval and input performed by software (Alho, Hänninen, Neittaanmäki, & Tammilehto, 2018). Software robots can be classified into four different categories: The first one is highly customized

software that is only capable of working with certain types of processes, such as specific accounting and finance tasks like invoice handling or account reconciliation. The second category focuses mainly on screen scraping, which automates data collection, synthesis, and attachment to the document as far as possible. The third category includes development tools that provide a customizable template from which specialist programmers design the appropriate robot. The fourth category includes enterprise-ready, scalable, and reusable software, such as Microsoft Power Automate Desktop. (Lhuer, 2016.)

RPA is mainly used for tasks whose automation by traditional means on the back-end side, i.e., in the background system, is either not possible or not economically sensible (Kaarlejärvi & Salminen, 2018, p. 53). It has been widely adopted in various industries, including accounting, to automate clearly defined and repetitive tasks (Huang & Vasarhelyi, 2019). In financial management processes, it is currently seen as the most useful form of automation. RPA is well suited for regular, repetitive tasks where specific information is processed in electronic form. (Kaarlejärvi & Salminen, 2018, p. 51.) The deployment of RPA for automating office tasks is facilitated by the fact that it is the simplest of the currently available intelligent automation tools. Another strong point for it is that the information systems previously used by humans can be kept in use without any modifications required (Bichler et al., 2018). The software robot thus acts as if it were a digital version of a normal employee; it uses other software, such as an accounting system, mainly through the user interface, just like a human worker would (Kaarlejärvi & Salminen, 2018, p. 53)

2.3.2 Benefits

Just like using traditional robots for physical labour, using software robots for information work tasks offers numerous advantages over human-done work: it works faster and more accurately, and it does not get tired, meaning that it may be used around the clock at best. Thus, it frees people to do tasks that require more of the strengths that human workers have over robots, such as emotional intelligence, judgment, or communication skills. In addition, when successfully utilized, software robotics can achieve significant economic benefits and is in fact currently seen as a rapid means to achieve a high return on investment (ROI) (Bichler et al., 2018). Among 16 companies that participated in a case study conducted by the London School of Economics, the return on capital invested in RPA ranged between 30 and 200% during the first year of operation already (Lhuer, 2016). However, the benefits are not limited only to short-term economic benefits; the software robot follows the rules defined for it precisely, and in possible problem situations, the work steps performed by the robot can be determined from the log files, in which all the actions performed by the robot are saved automatically (Kaarlejärvi & Salminen, 2018, pp. 53–55). When the deployment and development work of the software robot is successful, RPA will also be able to achieve performance that is easily scalable. For example, in highly regulated sectors such as the insurance and banking sectors, automation has proven to be an

inexpensive and fast way to obtain superior capacity to comply with regulations and regulations compared to traditional methods. (Lhuer, 2016.) Implementing RPA for suitable work tasks is often also cheaper and faster than recruiting and orienting a new employee (Kaarlejärvi & Salminen, 2018, p. 54). As the amount of regulation and data being processed in business activities increases, so does the workload of companies, and RPA is one of the enablers for handling a larger workload than ever before (Lhuer, 2016).

As mentioned earlier, software robots can be used to free up human working hours from simple routine tasks to ones that require more skills characteristic for humans, such as communicating with customers and considering the measures required by possible findings that come up from data after being processed. In this way, in addition to improving efficiency, job satisfaction can also be improved using automation tools such as RPA. (Kaarlejärvi & Salminen, 2018, pp. 53–55.) Employees have in fact often welcomed the new technology, since it has been able to perform tasks that have been seen as undesirable by the employees. The quality of customer service has also been found to improve in some cases, when people's working time is freed from tiresome routine tasks to communicating with customers, for example. (Lhuer, 2016.) According to Kaarlejärvi & Salminen (2018, pp. 53–55), routines suitable to be dealt with RPA can thus be handled faster, more accurately and possibly better than before.

2.3.3 Potential use cases

Demand from commercial suppliers of RPA tools has grown significantly over the past few years. This is not particularly surprising, as most organizations are still looking for ways to reduce costs as well as quickly link together old applications that are still in use. (Bichler et al., 2018.) Software robotics is best suited for performing tasks for which precise rules and guidelines can be defined (Alho et al., 2018). As a financial management tool, RPA can complement the automation of basic systems such as accounting and travel invoicing systems. For example, it can be used to transfer data between different information systems, to perform checks between several different information systems, to manage processes within systems, or to start runs of certain processes.

A software robot can use the same computer applications as a human, which means that it can, among other things, retrieve information from websites, send and receive e-mails or copy data from Excel files to whichever information systems the company may be using. Moving data from one system to another automatically with an integrated solution is the end goal for many companies, but as such an integrated solutions often take more time and resources to develop, RPA can be used as a temporary solution until a more effective method has been developed and proven reliable. RPA is particularly suitable for routine processes where there are manual work steps, where the number of events is large, and which are repeated with a logically defined set of rules. (Kaarlejärvi & Salminen, 2018, pp. 53–55.) Many of the tasks related to reporting, documentation, storage and analysis could actually be left to software robots as long as the processes remain unchanged for enough time, and resources are allocated to automating

the tasks (Alho et al., 2018). RPA should also be utilized for work tasks where the workload is unevenly distributed over e.g., the month, quarter, or year, which may otherwise hinder the performance of other tasks during the busiest period. For example, during the change of an accounting period, several closing steps are often taken within a few working days, at which point automation could balance the workload, improving the final result of the work. (Kaarlejärvi & Salminen, 2018, pp. 53–55.)

One use case of RPA that is well known in the academic world, is a case study conducted at Xchanging. The aim of the study was to find out the effects of RPA on the company's business from both an operational and a long-term strategic perspective. Since RPA is still a relatively new technology, claims about its positive effects on business value are often still received quite sceptically. Therefore, case studies conducted by researchers at the London School of Economics and Political Science aimed to provide organizations considering the deployment of RPA with genuine and realistic examples of successful adoption of this technology. As an example, one successful end outcome of the case study with Xchanging was that the software robot developed for the study reduced the time it took to form a price recommendation for 500 premiums from two days to just 30 minutes. In addition to an immensely quicker working speed compared to humans, the software robot also managed to make the process flawless. Once the robot was developed for the task, the workload it performed could be easily scaled according to the workload without personnel management issues such as challenges with employee availability, training, or overtime costs. (Willcocks et al., 2015.) Even though the result of this specific example sounds extremely positive, it is still important to keep in mind that if the information systems or the process itself changes, the software robot must also be modified accordingly.

There is also some information available regarding the utilization of RPA from Finnish companies as well. For example, OpusCapita Group is a Finnish company offering financial processes and outsourcing services, focusing especially on Purchase-to-Pay (P2P) and Order-to-Cash (O2C) processes for medium-sized and large companies. By investing in RPA, the company aims to stay ahead of its competition in the automation of financial processes. It markets software robots as virtual assistants to employees who are involved in repetitive tasks related to financial processes. In their view, after a short period of development, these virtual assistants will be able to bear the burden of routine tasks, allowing companies to focus their staff on more productive and creative tasks. One of their most important services sold for customers is the complete adaptation of the financial processes of customer companies to be handled by robotic automation. According to Jaakko Lehtinen, Director of OpusCapita's Ventures Unit, RPA dramatically improves the quality and efficiency of business processes in several areas, and the finance department is the perfect environment for its usage. (Asatiani & Penttinen, 2016.)

Process mining techniques have also recently begun to be used for detecting new usage applications for RPA. For example, RPA vendor UiPath and process mining company Celonis have collaborated to visualize and select processes with

the highest automation potential, after which they develop, test, and deploy software robots driven by process models detected. Process extraction makes it possible to find, monitor and improve existing processes by collecting information from activity logs, after which the parts of the process suitable for software robotics can be selected. (Aalst, 2012; Bichler et al., 2018.) Combining process mining techniques with RPA development seems like a logical decision, since the most vital requirement for taking advantage of RPA is deep understanding and step-by-step analysis of the processes it will be used for.

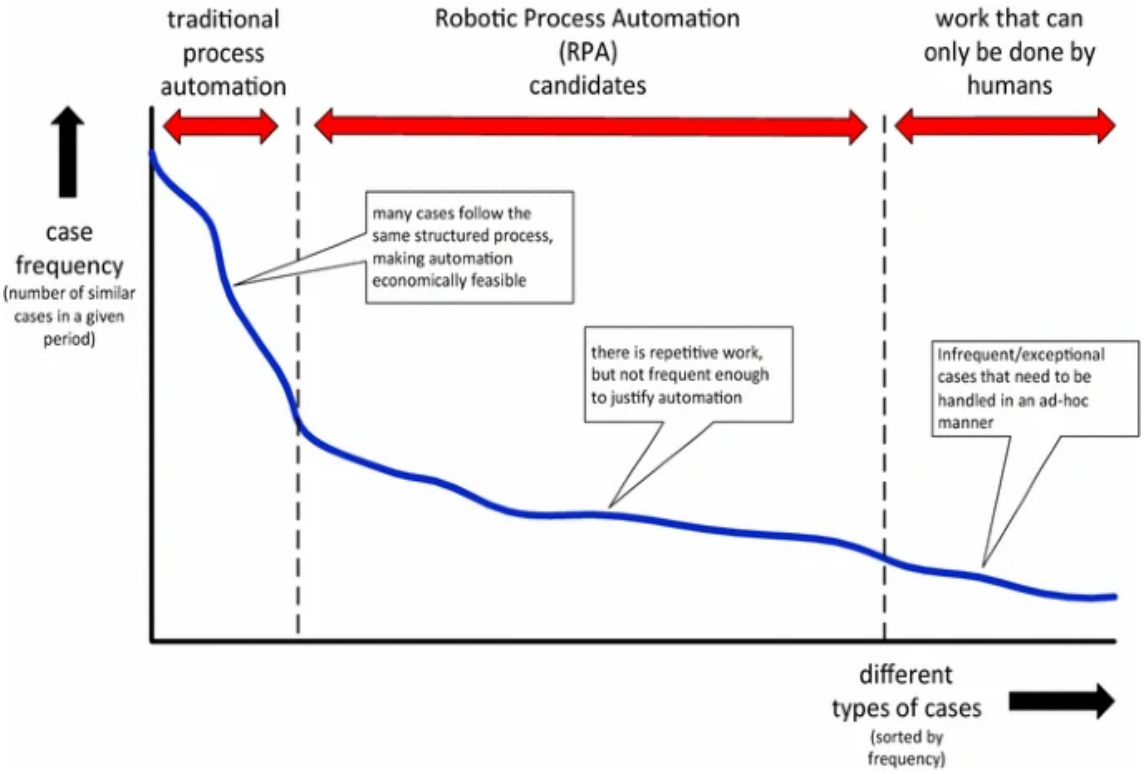

FIGURE 2 Positioning RPA (Bichler et al., 2018)

2.3.4 Limitations

The rapid growth in demand for RPA suggests that it would be a completely new concept. However, similar solutions have been offered in the past under different designations. For example, in the mid-1990s there was great enthusiasm for Straight Through Processing (STP), especially in the financial sector (Hee, Yu, Matthes, & Papazoglou, 2002; Hofstede, Aalst, Adams, & Russell, 2010). The term refers to processes that can be performed without any human involvement; for example, automatic transfer of electronically entered data in a settlement process between the parties without having to manually re-enter the same data. However, STP proved to be suitable for only a few of the processes positioned in the left section of Figure 2 above. Next, workflow management systems evolved into Business Project Management (BPM) systems focusing on the more administrative aspects of business processes. The general problem with BPM projects is on

the other hand is too high a cost, as BPM systems must be developed from scratch, and integration between systems tends to be quite expensive. (Bichler et al., 2018.)

RPA differs from STP and BPM in that instead of redesigning the system, human users of pre-existing systems are simply replaced by a robot, which makes deployment faster and less expensive. The goal of RPA is also to be better able to withstand technologies that precede changes in forms and user interfaces if the core content remains unchanged. (Bichler et al., 2018.) However, it would be naïve not to recognize that the excitement around RPA shares many similarities with the past hype regarding STP and BPM. And although RPA does not share all the problems of its predecessors, its usage also has clear limitations of its own, of which some will now be examined in more detail.

First of all, RPA can only process electronic data that is in structured form (Kaarlejärvi & Salminen, 2018, p. 54). The accuracy of the information received, gathered, and handled by financial administration which the software robot should use is critical, as it is unable to assess the veracity of the information in a human way. Perhaps the biggest caveat limiting the usage of RPA in work tasks that would otherwise be suitable for it is the fact that poorly designed processes should not be automated with robotics. Because a software robot is a simple program that follows predefined rules, it is only suitable for tasks where the implementation of measures does not require any special consideration. (Kaarlejärvi & Salminen, 2018.) If a robot is used to perform inefficient or error-prone processes, it slavishly also performs the inefficient process steps, causing additional costs, errors, and unnecessary use of resources (Hofmann, Samp, & Urbach, 2020), not to even mention how frustrating it would be to develop automation for a process which is not clearly and effectively defined and documented. The inability of a robot to process data or handle exceptional situations in problem situations requires an expert to service the robot and to develop exception handling for it if necessary, in order to avoid getting stuck with the same problem in the future (Lhuer, 2016). Some of the exceptional cases within processes that are mostly automated are likely to continue to require human handling, so it is important to ensure a functional method of interaction between software robots and humans (Hofmann et al., 2020). Although a software robot can be used for reporting, for example, and it is ideally able to handle up to 90–95% of the workload of a certain process, it is however not able to analyse, parse and edit data into a more structured form by itself (Lhuer, 2016). Thus, people would still be needed to create the arrangement and visual look of a report, although this task may also be automated in the future by some more cognitive automation technology than current RPA. Since AI can already be used for generating full-length emails in the original writer's style (Dale, 2021), for writing real-time disaster news reports based on big data (Zamichos, Drosou, & Tzovaras, 2021), for learning to summarize articles with human feedback (Stiennon et al., 2020), and for creating computer programs from written descriptions (Chen et al., 2021), it does not seem too far off to imagine that in a decade or two, a more advanced method of automation could also automatically construct e.g. useful Power BI reports from the business data it is given for processing.

While RPA can be used to automate certain processes faster and easier than before, it may lead to management structures becoming more challenging and complex. Therefore, it is strongly up to the organization in question to decide whether it sees software robotics as only a temporary solution, or whether it becomes a longer-term part of their strategic capabilities. Organizations should therefore consider the advantages and disadvantages of RPA compared to other automation tools, and see it only as one of many methods that support process automation (Hofmann et al., 2020).

2.3.5 Requirements for successful implementation

RPA is a lightweight automation solution in the sense that it often does not require very much involvement of IT professionals to get it up and running. Business staff can learn how to configure and use robots to perform their own work tasks rather quickly, if they happen to have the willpower, the time, and the right tools available. (Lhuer, 2016.) Utilizing the interfaces of RPA development environments, users can build the necessary software robots themselves by arranging a chain of functions from configurable modules, creating a choreography for the robot that follows the required business rules (Aguirre & Rodriguez, 2017). The recording function is often used to facilitate this process, as it allows the robot to be built simply by following the tasks performed by the user as a model (Moffitt et al., 2018). Thus, the development of software robots does not always require special programming skills. Nevertheless, a basic understanding of how some key concepts in information systems work, such as the structure of loops, conditions, and parameters, data formats, and application interfaces, is extremely useful. However, the most crucial factor when developing RPA is an in-depth understanding of the processes being automated.

Although RPA is a lightweight solution, choosing the right approach to process automation requires the consideration of many aspects, including the organization's own capabilities, available resources, and the time required by the project (Hofmann et al., 2020). The introduction of RPA requires that the processes which are to be automated must be completely in electronic form. The accuracy of the data it uses must be verified, and the data must be in a structured form for the software robot to be able to utilize it. Before robotization, it is a good idea to first unify the processes and develop them to make sense if, after a closer look, all the steps or even complete tasks are found to be necessary at all. Deploying automation requires detailed process review, optimization, and documentation. After that, the developer needs to build and develop the process steps in a form that is suitable for the robot, as well as teach it to perform them step by step. (Hofmann et al., 2020; Kaarlejärvi & Salminen, 2018, pp. 53–55.) Perhaps the most important decision organizations willing to apply RPA must make is whether they want to apply RPA only using their own resources, or by utilizing external service providers (Vedder & Guynes, 2016), which is very likely a much easier way for most companies to try out the technology.

As with many other IT projects, successful major RPA deployment projects often require certain key people in the organization: for example, a high-level supporter to take the initiative for the project, to guarantee its funding, and to ensure the project progresses to completion. However, the sponsor does not necessarily sacrifice more than a few percent of their working time for the project, so the implementation also requires a project master who is responsible for the practical part of the project progress, spending most of their working time on it. The role of a project master requires, among other things, communicating the vision, taking care of motivation, and maintaining one's own influence in the direction of stakeholders. (Willcocks et al., 2015.) Decisions on stakeholder involvement should be based on the objectives of the project, and the project should include representatives of all relevant business areas, such as IT, finance, and human resources. Especially cooperation between business and IT functions has been found to be useful; For example, the IT team can facilitate the software robot's access to the company's ERP system and handle the robot's security monitoring. (Hofmann et al., 2020.) Of course, not all RPA projects have to be in such a large scale. But in general, even in smaller projects, at least an expert in the work that is going to be automated and a developer of robotics automation must participate in the development project for it to be successful (Alho et al., 2018).

Compared to a conventional information system design project, deployment of RPA is often faster and cheaper; the robot is often deployed in a matter of weeks, whereas developing new software and user interface to automate the same thing in a more conventional manner could easily take months. To implement software robotics, existing systems often do not need to be modified at all. (Kaarlejärvi & Salminen, 2018, pp. 53–55.) However, in order to maximize the benefits of a robot that has already been taken into use, the organization must be committed to monitoring, controlling and developing the robot when needed even after its initial introduction (Hofmann et al., 2020; Willcocks et al., 2015). Hofmann et al. (2020) suggest that decision makers should consider two types of metrics for measuring the success of RPA implementation: the first set would focus on internal variables such as improved employee productivity, job satisfaction, process acceleration, or cost savings. For example, to maintain efficiency improvements, a maximum acceptable error rate at which a software robot's utilization would continue to be effective could be determined using the Six Sigma method of quality management. The second set of metrics suggested by Hofmann et al. (2020) should focus on the software robot's impact on external factors, such as customer satisfaction and the level of collaboration with suppliers and company partners.

For the usage of RPA to become more widespread, it would need to be developed to be more versatile and easier to use and to develop. It is hoped that the use of artificial intelligence and machine learning techniques could also support more complex and less precisely defined tasks in the future. People learn by doing as well as with the help of a coach, and the same could be true for RPA in the future. For example, robotics tools could also be taught to adapt and deal with atypical cases by observing the problem solving of people when they deal with

system errors and minor changes in the process, such as changes in the forms that need to be filled or scraped. (Bichler et al., 2018.)

3 METHODOLOGY

3.1 Data collection

The empirical phase of the study was carried out as a qualitative study, utilizing semi-structured expert interviews as the data collection method. According to Metsämuuronen (2006, p. 83), the concept of qualitative research includes a whole range of different interpretive research practices. In this case, the material used to answer the research questions was collected by interviewing five RPA experts, some of which were RPA developers, and others were more focused on the introduction of RPA in financial tasks in their respective companies. The semi-structured expert interview is a very versatile data collection method, which makes it suitable for a wide range of purposes. Besides providing an opportunity to deepen the knowledge of the chosen topic, it also allows the interviewer and interviewee to delve deeper into the underlying rationale behind subjective views. (Hirsjärvi et al., 2007, p. 35.) In the semi-structured model, some aspect of the interview is pre-determined, yet the interview proceeds quite freely; it lacks the precise form and order of the questions which is inherent in structured form interviews. (Hirsjärvi et al., 2007, pp. 47–48.) The semi-structured interview enables the smooth examination of different topics during the course of just one interview (Yin, 2014). However, there are not many suitable ready-made models for analyzing free-form interview material, which may make the interpretation and reporting of results challenging for researchers (Hirsjärvi et al., 2007). Since research into the successful applications of RPA in financial management processes is still relatively limited and the field is evolving very rapidly, this interview study method is still well suited for addressing the topic.

The main goal when designing the interviews was to collect the highest quality answers possible for answering the defined research questions. The planning started with the development of an interview frame (Appendix 1), which would promote this goal by beginning the discussion and directing it to the most

essential aspects. Questions ranged from a straightforward definition of the term RPA to questions which required more of the interviewee's own reflection and mapped their own opinions about the future of RPA. The reason for including questions of the latter type was mainly for providing answers and thoughts to the third research question, which is more reflective in nature. This is why the interview was also directed to discuss the broader impact of using software automation in our society.

In the end, five RPA professionals working in various positions in Finnish companies were selected for the study. On the scale of Finnish companies, one of the companies represented is a medium-sized company and two are large, publicly listed companies. The first interviewee was found through connections made through studies, the second was found through a blog post where he had written about RPA on his company's website, and the third was selected on the recommendation of the previous interviewee. This meant that there was a bit of a snowball effect when selecting interviewees, where one interview led to another. Interviewees work in the roles of project manager, data scientist, and leading RPA developer, and their job descriptions range from RPA consulting and development to project management and the implementation of software robotics in their organization's controlling and other financial management related processes. Insights were thus gathered both from companies that develop RPA for other companies, as well as a company that buys RPA as an outside service for applying it into their own processes. The interviewees each have 3-7 years of work experience in the field of RPA, which may sound rather limited, but is explained by the young age of the entire industry. One interviewee has a master's degree in economics, and the other two are graduate engineers.

All of the interviews were conducted as online video interviews due to limitations set by the COVID-19 pandemic and distance constraints, and each of the interviews lasted between 40 and 50 minutes. The language of the interview was Finnish in all of the cases. The interviews were recorded as audio files in such a way that the interviewees were aware of both the recording and their participation in the study. Respondents openly shared their views on the use of RPA and its wider implications for working life possibly partly due to the anonymous nature of the study, however sensitive information was not addressed in the interviews. The material was handled anonymously throughout the whole study; the names, employers or any other identifying information of the interviewees are not mentioned, and all recordings were deleted after manually transcribing them. Prior to participating in the interview, the interview frame was sent to respondents for ensuring both their suitability for the interview as well as their adequate understanding of the topics discussed (Appendix 1). They were also requested to fill in and send a pre-information form (Appendix 2) electronically prior to the interview. As mentioned earlier, the recordings collected after the interviews were transcribed for the purpose of facilitating content analysis.

3.2 Data analysis

The aim of this study is to expand on current research in RPA by reporting on its proven uses observed through practical experience, while also providing an updated snapshot of its current state of usage compared to previous studies. In order to achieve this goal, a qualitative study utilizing content analysis was selected as the most suitable approach within the scope of this master's degree. Qualitative research is interpretive in nature and is based on a wealth of empirical data (Vaivio, 2008). Qualitative researchers focus on developing new insights and deeper understanding rather than just re-evaluating pre-existing theories (Taylor, Bogdan, & DeVault, 2016, p. 165), which is linked more to the expression of subjective reality rather than to the clarification of objective reality (Ahrens & Chapman 2006, 819). The aim was therefore not to create a test case that was as closely controlled as possible in accordance with positivist ideology, but to elicit stories from companies about their experiences with the technology in question and to compare it with the findings of previous literature.

The data collected for the study was analyzed using the content analysis method, which is a widely used technique in the analysis of qualitative research data (Hsieh & Shannon, 2005). As its name implies, it refers to the analysis of content that can be either written, heard or seen. The analysis can be either data- or theory-based or theory-driven. In theory-driven content analysis, theory always serves as support for analysis, even if the analysis is not based directly on theory itself. Although the units of analysis are extracted from the data, the previous information guides the performance of the analysis and thus its effect is clearly noticeable. (Tuomi & Sarajärvi, 2018, p. 96.) The theory also helps in forming research questions and in predicting which variables emerge from the data and in what respect these variables are related to each other. Within the framework of this study, the most appropriate means of analysis is theory-guided analysis, as there is already previous research and pre-existing theory on RPA, but it is still incomplete and would thus benefit from further consideration. From a theory-guiding perspective, the goal is usually to either reinforce or expand existing theories. (Hsieh & Shannon, 2005.) That is the goal in this context as well.

In the case of this dissertation, the analysis is guided by previous research on the use of RPA controlling tasks, such as various management accounting processes. Based on previous research, the analysis focused in particular on the specific features of financial management use cases suitable for the application of RPA, the benefits of its application and its limitations. In addition, views were analyzed regarding what the application of RPA really requires from a company, and whether its wider utilization will also change the competence requirements of information workers in the organizations that decide to use it. Overall, the topics raised from previous research material were also examined in detail in the study of the interview material of this thesis. These studies which influence the theoretical aspect of content analysis were discussed in more detail in the second chapter of this dissertation.

Hirsjärvi and Hurme (2008) have divided the analysing of material in the content analysis into four stages, which are: the description of the material, the classification of the material, the combination of the material and the interpretation of the material. In the first stage, i.e., in the description of the material, a mapping of the features and characteristics of the research objects is made. The goal for this is to answer questions about who does, where, when, and how much. In the second stage, classification is used to create a framework for interpreting, simplifying, and summarizing the material. In the third step, the data are combined either according to the similarities and regularities observed, or according to variations and exceptions. In the fourth step, the material is finally interpreted. In this last stage, the aim is to see the material from a more holistic standpoint, as well as to highlight the social significance of the phenomena under study. (Hirsjärvi & Hurme, 2008.)

In this dissertation, the similarities and differences in the interviewees' responses were analyzed from the empirical material compiled from the interview transcripts of the five experts, and the issues raised in the interviews were compared with the results derived in the literature collected for the theoretical framework section. The comparison was carried out by dividing the spelled material into different topics, such as the definition of RPA, the conditions and requirements for its introduction and its possible effects on the change in the job description and competence requirements of financial management professionals and other information workers. Finally, the findings were used to answer the research questions as thoroughly as possible within the framework of this thesis, and an attempt was made to assess the development of the features and use of RPA in the near future, however challenging it may be to predict it accurately.

Assessing the reliability of a study plays an essential role in conducting high quality qualitative research due to the nature of the research method and the phenomenon under consideration. Good qualitative research should always aim to be as neutral, consistent, truthful, and applicable as possible. (Metsämuuronen, 2006, p. 200.) The researcher's ability to evaluate the strengths and weaknesses of their own work is emphasized in achieving this goal, especially in a case such as this thesis, where no ready-made model is available for analyzing the obtained research results. The purpose of reliability assessment is to obtain confirmation that the research results are indeed meaningful and accurate, and not merely the result of extraordinary factors (Metsämuuronen, 2006, p. 206). The interviewees of this thesis were experts in the topics discussed, the quality of the recordings was good, and the subjects had no inherent motive to deviate from their own genuine views in their answers since there was no obvious benefit to be gained from it, and the identities of the interviewees and their organizations remain anonymous. Therefore, the condition of sufficient reliability of the study can be considered fulfilled in this case. The research can also be considered valid, as the themes raised in the interviews are repeated both in the theoretical framework section as well as in the interviews conducted with persons from varying backgrounds who are working in different organizations.

4 RESULTS

4.1 Overview of results

The aim of the empirical section of this dissertation was to find as practical observations as possible to answer the research questions in mind. The facts and opinions that emerged from the interview material largely followed the findings specified in the theoretical framework section, however some minor differences were also identified. In the research results, RPA is sometimes referred to by the broader umbrella term robotics, but according to the scope of the study and the interviews, these results only apply to RPA. The results section quotes excerpts from the interviews, separated by the interviewee numbers specified in the table below. The table also details the professional titles of the interviewees, their educational backgrounds, and the industry of their employer companies. However, in order to maintain the anonymity of the interviewees, their own or their employers' names are not mentioned in the study, as such information would not be relevant in the context of this study.

TABLE 1 Introduction of the interviewees

Interviewee ID	Interviewee job title	Industry of the employer company	Educational background of the interviewee
I1	Project manager, implementation	Industrial products and services	Master of Business Administration
I2	Data scientist	Software design and production	M. Sc. in Information Management
I3	Lead RPA developer	IT consulting, IT Services	M.Sc. in Automation Engineering
I4	Solutions Consultant	IT consulting, IT Services	M. Sc. in Economics
I5	Business Controller	IT consulting, IT Services	Master of Business Administration

4.2 Definition, advantages & applications

The interviewees defined RPA as specific operating models taught to a computer program, which then aims to imitate the actions of a human user. RPA solutions are usually automated by spying and interacting with a user interface that human workers would use as well, although this is not always the case. Of course, different systems can also be integrated e.g., via an application programming interface or API for short, however that is not the main focus of RPA at least in the current state of the field. This focus on the user interface is actually what differentiates RPA from other ways of implementing automation. So-called smarter automation and machine learning solutions are already at the more advanced level in terms of development, which makes RPA a simpler form of computer automation. However, the interviewees pointed out that the terminology of the subject area is not very precise. In the company of the first interviewee, the term "Robotic Process Automation" has been replaced with "Software Robotics" to avoid mixing it up with other types of automation that the company sells to their customers.

> ” RPA can be defined as operating models and process paths taught to a computer program, which aim to imitate the actions of a human user.” (I1)

> ” A software robot is a computer program that independently uses another computer program like a human, usually automating business-oriented processes. So, a person no longer manually clicks on different systems, instead a robot program does the same actions so humans won’t need to.” (I2)

> ” Everything that counts as RPA is open to interpretation. It doesn't matter what the term is, as long as the customer's problem can be solved.” (I3)

Time and cost savings emerged as the most important benefits which can be achieved by using RPA. The greatest benefit is usually found in target processes which involve repetitive tasks with high transaction volume. When repetitive and routine tasks can be assigned to a machine, human workers have more working time to spend on work tasks which require more thinking. These mostly include more challenging and non-standard tasks where you have to use human reasoning. RPA can also often be chosen as a solution in specific time periods where more work needs to be done than usual, and the reasons behind these busier times may either be part of a routine or an unexpected situation that the company is facing.

> ” It is good to recognize that at certain times of the month, for example during reporting, there is more to do than 7.5 hours a day, and during these times people are extremely busy. These minutes and hours per month are basically more valuable to us than others. This advantage of robotics can particularly be seen in the latest case we got into production, which is related to balance sheet breakdown during the change of season reporting.” (I1)

> ” Sudden situations, such as the corona virus outbreak or changes in legislation, which have required additional resources to work in just a few days’ notice, have often been solved with the help of RPA. It has also enabled solving some situations where, for example, there is no money or a realistic possibility to handle the matter with manual work. For example, it is interesting to follow the unravelling outcome to the current salary calculation problems of the city of Helsinki, because those issues probably cannot be solved by manual work alone.” (I4)

> ” I found the adoption of RPA really useful. First of all, the software robots freed up time: in the previous corporation which I worked for, before software robots it could have taken up to an hour or two just to run the sales receipt reports of all the different companies in the corporation from different accounting systems. The fact that someone did it for you freed up working time for everything else. In my previous employer company, quite a lot of these simple but time-consuming financial processes had actually been automated. Thanks to the robots, it was possible to focus on more essential tasks. In my opinion, tasks like that where they fill out some manual excels that don't require any major thought work shouldn't be the most important tasks for a person. From the company's point of view, automation also saves money, for example, we received huge amounts of purchase invoices, and automating the distribution of online invoices to the right people for processing, validation and accounting saved a lot of time. Before automation, there were many people at work who basically had to take in online invoices and hand them out manually to people for review as their day job.” (I5)

Automation can often reduce the likelihood of errors according to the interviewees’ first-hand experiences, since software robots aren’t prone to e.g., typographical errors or one-off mistakes which are rather typical for human users.

> "When writing e-mails in the past, you had to be careful not to accidentally send information from one company to another, but when these e-mails started to be sent automatically via a robot to the right people, the risk of human error in work tasks also decreased. And in general, anything can happen when you run reports yourself, filter and edit various Excel files and the like. In these aspects as well, the risk of human errors disappeared when using the robot, which was definitely one additional benefit." (I5)

The enjoyability of people's work increases when the pressure from tight schedules is eased with the help of RPA during busy times. The increase in well-being at work was a benefit which was repeatedly brought up in the interviews through the fact that dull tasks can often be left for the robot to handle. The easing of people's workload and the higher emphasis of working time on more meaningful tasks has contributed to the positive reception of RPA and to the enthusiastic participation in the implementation among employees on the financial side. Especially the tasks that are the first to be automated are the so-called low-hanging fruits: unpleasant, high-volume tasks that people themselves do not like to do. Thus, people are usually excited if a robot is developed to do them, so that the person can focus on the more essential parts of their work. The interviews hinted that automating these dull tasks can make work more meaningful, and even contribute to the transformation of the controllers' job description discussed in the second chapter (Lawson, 2019; Moffitt et al., 2018)

> " Then there can be this kind of really boring work, like it takes you an hour in the morning to copy data from there to there, there, there, there... The level of annoyance is already starting to rise first thing in the morning, so it's easier to give such a task to a robot." (I3)

> " The automation of tasks definitely made work more meaningful. I personally don't really like very routinely and monotonous tasks, but I enjoy if there is some challenge in the work I do. It was quite a salvation that we started automating routine tasks, which previously had to be done, for example, every day or week, but now robots started to handle many such boring time-consuming tasks that did not require any kind of brain work. With the robots, more time was freed up to work on more important tasks, such as all the analysis and metrics and those kinds of things that the business controller should be able to focus more on; the future, where we are going and development work instead of just doing manual tasks." (I5)

One benefit which may not immediately come to mind regarding RPA is due to the swiftness of RPA development projects compared to traditional system development: it can be used as a way to promote a culture of experimentation.

> " With RPA, new innovations and ideas about how things could be handled in a different way can also be inexpensively tried out in the spirit of a culture of experimentation, without the experiment immediately requiring an expensive system development project." (I4)

However, RPA does not usually come without its own issues which need to be solved. Even in more formulaic processes, such as invoicing, there may also be

exceptions where a person is needed to solve the handling of the exceptional situation. This kind of exception could be, for example, missing information, such as an empty cell in an Excel table, from which the robot should have been able to extract information to perform the task independently. Some RPA development projects also have more major issues and may even end up failing, but it is important to learn the lessons available from those failures.

> ” Of course, RPA projects also fail from time to time, and the analysis of failed projects is also extremely important for the future.” (I4)

Financial administration is a common place to utilize RPA, as there are plenty of routine and precisely defined tasks. Financial data is usually in a digital and structured format, for example in Excel and various enterprise resource planning systems, which is why it is easy to also process the data mechanically. Due to these features, this area controllers also work in is often suitable ground for searching for application targets for RPA.

> ” Super boring routine tasks is probably the most common answer for places to use RPA on. That is, for example, tasks that only include transferring figures from one system to another or to Excel. It may be a common misconception that only simple tasks can be automated with it, but at least that's what I currently believe.” (I5)

Some of the common tasks to be automated include handling purchase and sales invoices, handling payroll and moving data such as income statements and balance sheets from accounting systems to reporting systems and consolidating the data. RPA could also be used more widely to e.g., spot anomalies in financial figures, as well as reconciliation differences. It seems that automation of controlling tasks could be more common in larger enterprises as opposed to smaller companies, where the scale of such functions may not be big enough for automation solutions to be worthwhile to develop.

> ” Especially tasks such as processing purchase and sales invoices, or, for example, manual additions or checks of customer transactions. I don't currently do payroll myself, but from what I've heard about the manual work involved in payroll, it would certainly be really good to develop automation in relation to that. Among my own tasks, for example, reconciliation calculations, transfer of data such as the income statement and balance sheet from accounting systems to reporting systems and their consolidation, as well as the automatic detection of reconciliation differences, are the kinds of tasks that would be really nice if they could be automated. And this is probably just the tip of the iceberg based on what suddenly comes to mind. For example, at the moment, in our company, processes on the financial side have not yet been automated very much, and there are many situations where you wonder why this has not been automated yet.” (I5)

One interviewee believed that we have only scratched the surface so far when it comes to automating financial management processes. When it comes to specific tasks belonging to controllers which could be automated, the discussion becomes a bit more challenging due to semantics and what is meant with the term controller in different contexts.

> ” In principle, there would be a lot of controller tasks that could be automated with RPA. However, we have only scratched the surface thus far, as the controlling functions are often quite small on the scale of the whole business. Therefore, they are not usually the first place to start automation. Many controlling functions are also often quite busy units of a few people, whose time is spent on handling urgent tasks before the potential mapping is even done. In principle, however, I believe that almost all manual financial management processes could be automated to a great extent with careful redesign and time. Many types of data verifications could also be done with automation more often than just e.g., monthly, quarterly, or annually if they did not tie up the time of human employees. However, the controller's role is one that varies in nature and depth quite a lot between different companies, which also makes defining the controller's tasks which could potentially be automated somewhat challenging.” (I4)

By utilizing robotics, it is also possible to carry out inspections that organizations either could not do or did not want to do before due to a lack of resources. This could also lead to a reduction in errors and issue in the business data used.

> ” Controlling tasks are largely based on data collection, and often in such tasks you can see how much of the time is spent simply digging for data. However, there is often not enough time left to correcting the way the data is generated, which leads to having to spend time every month making the same manual corrections to the data instead of fixing the problem with the data at its source. By utilizing RPA, the time spent collecting data could be reduced, which would free up time for data analysis and more permanent data consolidation. All kinds of data checkpoints are also really easy and sensible to automate. Nowadays, it can still be seen too often in almost every company that the same mistakes are repeated month after month due to lack of time. After all, economic functions tend to be error-prone and errors often repeat themselves, which is why a lot of time is spent looking for the causes of errors. If there is time to validate the data, for example, only once a quarter, searching for the root causes of errors can already take a lot of time. With RPA, you could, for example, take the intermediate values of the desired data points once a day or once an hour and match them. Thus, finding out the time and source of the errors would become much easier.” (I4)

The interviewees brought up numerous specific application areas, for example in the field of data inspection and review, invoicing, and customer collection automation. Tasks involving a lot of data validation and checking, for example in the area of invoicing and going through registers, came up repeatedly in the interviews. These are often boring routine tasks for humans, and the advantage of a software robot in doing them, in addition to a tireless and significantly faster work pace than humans, is that it does not make careless mistakes like humans do. The use cases brought up by the interviewees are listed in more detail below, with commentaries following each case.

> ” On the P2P (Purchase to Pay) side, one of our application targets is the validation of suppliers' master data. We have named our robot handling this task Rami. Rami validates that the information of our goods and service suppliers is correct in our master data. This is important because we only pay to suppliers who verifiably exist, and who have tax registrations and other things in order and who, for example, have the right to invoice us for VAT. The robot retrieves the supplier's master data from our various enterprise resource planning systems, compiles it in one place, to Excel in this case,

> and then we can see from our interface to the database of the Finnish Business Information System (abbreviated as BIS, or YTJ in Finnish) whether the company has managed its registration properly. After this, the robot compares the data between the sources, producing a list of suppliers according to whether the supplier's affairs are in order and up to date in our own system. The list goes on to our accountant, who then updates the master data. The inspection is done because there is a legal requirement for it: it has to be done quarterly, and manually it would take a lot of time." (I1)

Validation of supplier data is done in the company quarterly because there is a legal requirement for it. Because the company's supplier mass is so large, manual checking would require approximately 4.55 FTEs working on checks, according to the interviewee. The robot thus performs the inspection much more efficiently. The employer company of the first interviewee calculates the payback period of all the software robots it implements, which in this case was only 1.5 months. In addition to the financial interest, there was also a qualitative interest in the introduction of the robot in terms of the company's internal processes.

> " An example from the O2C (Order to Cash) side: Here, customer collection can be partly done with the help of a robot. In practice, the robot reminds our customers with poor memory who have not paid their bills on time. The robot retrieves a list of overdue payments from our enterprise resource planning system, then the robot goes to our customer management system and checks whether certain customer invoices have been marked there that a reminder should not be sent. If no checkmark is found there, then the robot prepares the payment reminder files and sends them electronically to those customers to whom the information can be sent by e-mail. For those customers for whom there is no email contact, the robot prepares a file, which can then be printed out by human hand and forwarded." (I1)

> " In the previous workplace, all responsible persons, such as sales managers, controllers, and the CFO, received an automatically generated email every week about open sales receivables, which contained an Excel listing of open sales receivables, sorted from the most overdue to the least overdue. The report included the customer, the invoice number, the delayed amount, and the duration of the delay. Everyone had to go through that listing and collect receivables from the customer. So, it was a matter of managing the sales receivables so that they wouldn't get too big." (I5)

Two cases of RPA assisting in customer collection were brought up during the interviews. The firstly mentioned customer collection robot had a repayment period of 8 months. In terms of the amount of work, the case of customer collection is not as significant as the validation of supplier data, but the financial interest is still greater in realizing money from the customer to the company's own coffers.

> " Another example from the O2C side: Daily checks of payment traffic. Our payments team manages both outgoing and incoming money. In addition, they process information related to payments and currencies in various enterprise resource planning systems. For example, we have to make checks related to exchange rates every day, because exchange rates vary daily. All information is then collected in a centralized payment management system. The robot checks the bank account balances daily and compares them with our ERP systems, downloads the exchange rates of the day from

> the European Central Bank into the ERP systems, and produces a report on whether everything has been done and which things were in order, and which were not." (I1)

According to the interviewee, process efficiency is particularly sought after using the robot in the daily inspections of payment traffic: The robot completes the inspections in the morning, so that they are already ready when people arrive for work in the morning. The payback period for the robot was 5 months.

> " I did a project related to internal invoicing for my employer. If the company has different business units in different countries, for example, and the units make internal invoicing between each other, then the processing of information related to this process can be automated with RPA. In this case, our invoicing system had to retrieve all invoiced hours for different business units and cross-screen them to ensure the correctness of the invoicing. An Excel spreadsheet was then produced from the results, which the robot forwarded." (I2)

Checking the invoicing data was previously done by hand, but the interviewee implemented a robot for his employer in between his client projects, with which the task could be automated.

> " In our client's web-based system, invoices from different suppliers are accepted in XML format, and the robot has been taught the rules of how to process each supplier's invoices. Suppliers have been added over the years as the number of invoices has increased. The robot grinds the invoices in the system non-stop." (I3)

If the new supplier's way of handling invoices differs from previous suppliers' invoices, the robot must therefore be taught new rules for handling its invoices.

> " Quarterly advance collection register inspection for suppliers: In some companies, the inspection of data is integrated into the transaction directly from the interfaces of the Company and community information system. If such an ideal solution has not been implemented, then a robot could also retrieve data from the Finnish Business Information System for Excel, for example. After that, the robot could mark in the customer's system, for example, that this supplier is no longer available." (I3)

Checking data from the register of BIS was already mentioned in the first example as well. According to the interviewees, an integration solution via APIs is usually the best course of action in similar situations, but the same thing can be handled with RPA using other methods as well.

> " Another fully automated process was the payroll reports: all you had to do was press one button, and the statements started to build themselves." (I5)

Payroll is one viable task for automation which is not usually part of the controllers' job description these days, but it was also brought up during the interviews since it has a lot of volume but is not usually considered a very pleasant or stimulating task. The controller interviewed had in fact seen one such software robot in use.

> ” A good example of a control which can be implemented with RPA is from an industry focused on customer meetings and invoicing, where an automation solution gathered the utilization rates of reception times for a report, calculated their turnover and also predicted the turnover of already reserved times and how many free times were still available for sale.” (I4)

RPA can also be used to generate various reports which would quite possibly not be generated if they had to be done by a human employee every time. This can in turn improve the quality of information the company has available for managing their business.

4.3 Prerequisites for utilization

Even though RPA is a reasonably simple automation method, the company using it and the process that is to be automated must meet some basic requirements to guarantee a successful application. Even before considering RPA implementation, it must be understood that RPA is not suitable for all tasks, and that is why it is important to know its limitations in order to be able to understand the applications that are best suited for it. In other words, it is crucial to develop an understanding of what you are planning to do with it and why.

> ” The most important thing with RPA implementation is to know what you are doing in the first place. In other words, choosing RPA as the tool of choice should be a really well-thought-out decision, which is why I myself really emphasize to clients that RPA is neither suitable nor the right solution for everything, even if some operators may sell RPA as such. Therefore, it is important to understand which parts of the processes it should be applied to, and to ensure that it is really being used in the right place.” (I4)

Next, we will look at the specific features of processes suitable for applying RPA that came up in the interviews. First of all, it is good to make sure that all the steps of the process to which you want to apply RPA, as well as all the necessary data, are in digital form. Although it is nowadays possible to interpret handwritten documents by using optical character recognition, or OCR in short, (Nguyen, Jatowt, Coustaty, & Doucet, 2021), the technique is prone to errors and complicates the development and implementation of the software robot considerably. Besides being digital, it would also be good for the data to be processed to already be in structured form. Common structured forms of data used by software robots include Excel tables, SQL databases and .csv or .XML files.

> ” Text recognition and other technologies are of course developing quickly, but if you want to get started with software robotics quickly, the information must be structured.” (I1)

The process flow itself must be known and must be precisely defined in order to know what should happen in the process when it is automated. It is a necessary

basic requirement so that the definition can be done for the robot. Then it knows how to do the right things and take exceptions and error situations which would be good to know about the process into account.

> ” The process must have clear rules and be a repeatable process. In other words, robots are still "stupid" in the sense that they usually require ready-made rules.” (I1)

The task should also not require the reasoning ability of the human brain to perform it, so it should be as unambiguous and easily reproducible as possible.

> ” There should be no "what if" situations in the process; it must be as straightforward as possible. These "what if" cases are often difficult to recall for the subject matter expert when defining the process for automation which they have been doing themselves for 10 years.” (I3)

> ” If you can describe the task very simply without side sentences for a summer employee, then the task is probably also suitable for a robot to handle.” (I3)

In order for the introduction of RPA to be successful, the prerequisites for success must already be in place at the process end, so that a clear case exists where robotics would be applied. Therefore, you have to know exactly which processes you want to automate, and why. This in turn requires considerations, process analysis and calculations about whether automation is profitable at all. Cost savings from automating a process with a large volume seems to be the most common reason RPA would be taken into use; however other motives may exist as well. For instance, some things may be inexpensive to first try out using RPA before considering a more permanent implementation.

> ” First of all, the prerequisites for success must be ready at the end of the process. In other words, there must be a clear case.” (I1)

> ” The process must have a strong basis for why RPA would be used in it. The reason could be, for example, that there is more work than manual labour available, or it would be cheap and easy to try out doing some things with a robot before taking them to be done with an information system update, or to create new products or services on top of existing ones. The business case must therefore be in order, whether the benefit sought is purely monetary or something else. So, what you are doing must be crystal clear.” (I4)

A large volume is usually a prerequisite for achieving benefits from automation, but it depends on the use case, and what is sought with automation.

> ” Of course, the basics must also be in order, i.e., there must be sufficient volume and the development project should be profitable to implement.” (I4)

Even in some lower volume cases, RPA can be useful for other reasons, such as the high accuracy of the robot, the low amount of time it takes to train the robot for the task, or due to tasks falling into a busy time. Procedures that are rarely performed can also be forgotten by a person, when it takes a lot of time to remember and relearn them compared to performing the procedure itself. With a

robot, there is no such problem with forgetting. One interviewee brought up examples of legal changes, which required new workforce to be trained and utilized as quickly as possible to be able to react to the new situation.

> ” Urgency may act as one motive for RPA usage: for example, it is necessary to be able to quickly adapt to a legislative change. The recent Finnish healthcare reforms are a good example: no one has time to develop new systems or change them quickly enough, but it is still necessary to be able to operate in accordance with the reforms. The same thing is also happening in the banking sector: recently, blacklists and Know Your Customer (KYC)-style issues have required additional work from banks, which they just haven’t been able to put people to work on, so the sudden shortage of employees has been patched up by developing and putting, for example, 50 software robots to work on these new tasks.” (I4)

If the competence required for RPA development cannot be found within the company, according to the interviewees it should be purchased from external service providers at least until the capabilities have been developed in-house as well. Four of the five interviewees work in companies that develop and/or maintain RPA for external customers, and one interviewee's employer company buys its robotics technological know-how from a robotics supplier such as the companies the other interviewees work for. Outsourcing development work seems to be the most common practice for companies willing to take advantage of RPA.

At the process end, there must be sufficiently skilled human resources for the process itself so that an accurate process definition document can be created for developing the robot, and the future owners of the robot must be committed to the development of the process. Development work requires time, and it would be advisable to create a realistic schedule for it. A positive attitude climate promotes commitment to this development work.

> ” The process owner must have people available who know exactly the workflow of the process at the level of pressing each button. We therefore need cooperation with a person who works on the automated process every day. So-called silent information should also be described to the robot.” (I1)

> ” The implementation requires process description skills above all if the processes have not already been described. The developer needs accurate process descriptions to develop the robot. Depending on the situation, the pros photographer and the developer can be either the same person or a different person.” (I2)

> ” The right attitude to development work is required: you must have the desire to make processes better. Usually, the person who proposed the development idea has a good attitude, and he gets to participate in the development work.” (I1)

> ” The customer must be committed to the job.” (I3)

Even if the robotics solution is purchased from an external supplier, there must also be someone on the customer's side to lead the project. Since the software robot cannot function as it is forever, for example due to system changes, it must have a master user, i.e., a responsible person. Cooperation and communication

between different actors are important in order for the development work, as well as the usage of the robot in a production environment, to proceed smoothly over time. Information must flow between the financial department and the IT department, so that everyone involved knows what is being done, why it is being done and when it is being done. The task of the customer's IT side is also to ensure that the systems are mapped as suitable for the robot, and that the user rights are in order for the robot.

> ” The systems used by robotics must have good enough know-how and support from the customer’s side. In our organization, it is the role of the IT department. They take care of e.g., that the systems have been mapped as suitable for robotics and that the access rights are in order for the robot. There must also be a certain IT infrastructure: Since the process goes so that the robot is first developed and then taken to production, the robotics must have servers, licenses, etc. in order for both the development environment and production.” (I1)

> ” Technical infrastructure and related capabilities are required. Does the robot run, for example, on the user’s own machine or in the cloud? In addition, cooperation between business and IT is needed.” (I2)

> ” The matter is communicated within the company, and not just by some IT boss deciding to implement a robotics solution without the financial side having information available about it. If the robot, for example, sends e-mails, people involved must know about it, so that they do not reply to the robot's messages in vain. There must also be a responsible person whose “employee” the robot is. Nothing else is certain other than that at some point the robot will no longer work as it is. So, someone has to be the foreperson following the robot's actions. For example, you must be aware of user interface changes. Does the robot still do what it's supposed to when the UI has changed?” (I3)

4.4 Implementation process

You can look for RPA application targets, for example, using the customer company's own tracking tool, where employees can write down ideas that come to mind. One way is also to hire an automation consultant and co-operate with them to find processes viable for automation. In order to apply RPA to the case, the underlying process should be stable enough to guarantee a reasonable lifetime of the robot without significant rework of the robot’s work logic. If it is decided to solve the case with RPA, the process must be defined very precisely. A process diagram is made from it, and details are collected, for example, about the robot's operating times and possible maintenance breaks in the systems. Before developing a software robot, it is important to consider whether its use makes sense in automating the case in question, and whether all the steps in the process are even necessary. This is not always the case.

> ” First, we discuss the process with the customer: Does it make business sense to automate the process, is a software robot technically possible to implement. For example,

> one customer wanted the robot to print documents to the printer, until after a more detailed review it became clear that there was no need to print any documents. It was not even known why the documents were printed at all." (I3)

It must also be considered whether the case meets all the critical requirements for using a software robot, how it could be robotized with little effort, and what benefits would be achieved by robotization. When the customer has approved the plan and all the technical capabilities are in order, the development work of the software robot begins. After the development work is completed, the process is initially run together with the customer in a controlled manner in a phase called User Acceptance Testing (UAT), making sure that the robot does what it is supposed to. For this, test data must be available to the robot. If the robot works as planned and passes the UAT, it is put into production and its operation is initially monitored more closely than usual in the so-called hypercare phase. When the robot has been found to be functional, it is finally transferred to the normal monitoring environment. As a whole, the steps from detecting the intended use to implementing the software robot can proceed, for example, as follows:

1. " A three-part "Quick scan" form is filled in to check whether the mandatory criteria, such as digitality and clear rules, are met.
2. Assess how easily the robotization of the work would be possible, whether there are already documented work instructions for the process, how many different information systems the robot should process and what kind of technical characteristics the target systems have.
3. Consider the "business case" itself: how many transactions take place, how much time automation would save, whether it would help the company to produce a completely new kind of service and whether it would essentially reduce certain risks. The completed form provides a rough estimate of how much the FTE savings would be and what qualitative benefits could be achieved.
4. If the FTE savings are found to be large enough or not all tasks could be managed manually, the development of the case proceeds to the second stage. A more detailed business case calculation is filled in, and a process description is prepared.
5. Based on this information, a meeting will be held with the process owners where it will be decided whether to put the case into the development pipeline, where the external consultant would start the work required for developing the automation solution. In order to ensure a rational use of resources, the aim is to keep the criteria as clear as possible regarding which cases progress to development and which do not.
6. If the case is approved for development, a kick-off meeting is held with the IT side of the company and the external robotics development supplier and a process description of what the robot should do with its rules at the level of each mouse click is reviewed.
7. Product development begins, i.e., in practice, the external supplier's consultant starts developing the robot and, if necessary, asks for additional information from the subject matter experts of the process.
8. Next up is the user acceptance testing of the end users for the robot using actual production data, which checks the correct operation of the robot, and the detected deficiencies are taken for correction.

9. If the robot has had a successful run through, then the operation of the robot is monitored for a few runs to ensure its functionality.
10. The robot is transferred from the robotics consultant to the robotics service provider's continuous services department. There, the supplier monitors that the robots work according to the pre-agreed timing or function. If problems arise in production, the supplier will be contacted, after which further measures will be considered together." (I1)

However, software robots can also be implemented as considerably more straightforward projects. One of the interviewees gave an example of a lighter development project, where he developed a robot for his employer's monthly internal invoicing process between customer projects at the initiative of a person who previously did it manually.

> " The implementation of the project was profitable, despite the short life of just one year for the robot, because the implementation was done very lightly. The robot only ran on the employee's own machine when required, and the development of the robot took only a brief time. However, with the little effort put into the development work, many hours of this employee's working time were saved every month." (I2)

No matter if it is a large or a small RPA development project, possible errors and problem situations must also be considered. An important factor when developing software robots is to not only focus on the "happy path", where everything goes according to plan. It must also be defined how the robot as well as the company owning the robot will react to issues such as unresponsive systems or defective business data.

> " The robot's operation should be defined as well as possible even in the event of an error: for example, report the error to person X, perform steps 1 and 2, and try to see if the same process could be performed the next day. In principle, however, the organization should have some ability to manually perform the work which should have been automated in the event of a significant problem. For instance, data breaches could lead to a situation where a software robot would have to be withdrawn from production, and in the meantime, people should be able to handle the critical tasks previously handled by the robot. However, there may not have been enough focus for this topic in the field yet, even though the work steps themselves should be able to be done manually with the help of process definition documents used in the development work of the robot. However, we recommend to customers that each automation does not necessarily need its own dedicated backup, but that some kind of team or plan, such as a centralized support service for example, should still exist, which would start working on the process manually with the help of PDD documents in case of any serious problems." (I4)

After the implementation project is finished and the robot has been taken to production and it is working as expected, the robot should be set up for monitoring. It would also be valuable to go through the lessons learned from the project, although such reflection has sometimes been neglected.

> " Automations cannot be left to run on their own without strong ownership, or else they are at risk of crashing just like bad systems. It is therefore really important to

> monitor software robots even after they are put into production. One important thing from a learning point of view that people may not have been sufficiently invested in in the early days of the industry is the collection of benefits, realized degree of automation and other experiences from the project after it has been implemented." (I4)

To ensure that the degree of automation stays at a high level, and the software robot keeps doing what it is supposed to, it should have a supervisor or a colleague who ensures the appropriate functioning of the robot and is quick to react to possible issues. The person who is responsible for the functioning of the robot varies between processes and organizations.

> " In successful projects, it is essential that automation also has a so-called supervisor or colleague who takes care that the degree of automation remains, and who takes care of system changes and possible errors made by automation. Too often you see that no one monitors the operation of the software robot and after half a year it is noticed that the robot has been working incorrectly for a long time or has been working with a very low level of automation. Someone must therefore have strong leadership for the robot's work, be it a colleague or a supervisor. However, whose responsibility the robot takes on varies a lot depending on the organization and process." (I4)

A plan should also be in place in the possible case that the robot wouldn't work as planned, especially if there are major risks of disruptions in the company's core functions. This is not as much of an issue in tasks that aren't very time-critical, but it is still a factor that should be considered.

> " It is very possible that there were some problem cases with the software robots we used, but the only thing I can recall is that the automatic sales receipt lists sometimes failed to arrive because there was an error. However, I never experienced something going so badly wrong that I would even remember it. Chances are, if something has gone wrong, it has been fixed so quickly that no one has even noticed the whole thing. Had a more serious problem occurred, the tasks that the robot did would probably have been temporarily transferred to humans. However, many of the tasks handled by the robots were of the type that the world would not end even if the tasks were not done for a day or two. That means there would be time for fixing the robot before people would have to start handling the cases manually." (I5)

A vital component of the implementation process is to include subject matter experts from the start, as they are the ones who know the current process most thoroughly and can be relied on when defining the process and when facing possible issues or questions that arise during development and testing. Taking part in the implementation takes up the experts' time, so it would be good to consider how it is ensured that they have enough time to help with implementation alongside their usual working tasks.

> " The software robots came into use one by one at my previous workplace during the five years I worked there. We actually had meetings in which I was involved with a couple of companies developing software robotics. We from the financial department were actively being involved in the development. I was very involved in the online invoicing automation development project for when the rules were set behind each

> supplier regarding how the invoices from that supplier are forwarded automatically. In addition, invoicing was automated, meaning that, for example, invoices from a certain supplier are always billed to a certain account and to a certain cost center. Its introduction was of course a really big project, and it took a long time to set the right kinds of rules behind all the thousands of suppliers, to whom the invoices coming from them would be directed and which account and cost center would be set by default in the background for processing those invoices. But when that work was done, suddenly labour was no longer needed as much, which ends up being a really big saving for the company in the long run." (I5)

Since controllers tend to have quite busy schedules especially around specific times such as the change of the financial month, it might be a good idea to not have very tight schedules for the implementation on their part, which would enable them to take the time their participation requires when they have the time for it.

> " Since there was no real rush to develop the robot, there was time to participate in the development work in addition to other controlling duties. I think that if such things are introduced, there shouldn't be a terribly strict deadline, that everything has to be ready within a week. We did the RPA project quite slowly among several people, agreeing on who will handle setting the accounting rules for which companies. I did it when I felt like I had some extra time, like a little moment between other tasks. And since the definition didn't require any intense brain work, it was a kind of relaxing task to work on for an hour or two whenever there was time, before continuing with my other work." (I5)

Although most of the discussion with interviewees was focused on successful RPA implementations and the benefits achieved, common pitfalls in development projects which may even lead to the failure of the project were also discussed. According to the interviewees, the most common reason behind failed projects is the bad definition of the project to be automated, and starting development before the scope of the project is fully locked in. Testing and acceptance may also cause issues if there is not enough test data, or a competent subject matter expert is not available enough for the testing.

> " I would say that eleven out of ten failed projects are due to poor definition and too fast a start. That is, in the implementation phase, it must be crystal clear what we are doing and why. There must also be a clear tone regarding what exactly is going to be automated, and the process definition must be locked in before the development work can be continued. Automation projects usually go wrong when the definition is not locked in time. Testing and acceptance are also common stumbling blocks; the automation solution must be able to be tested well enough and validate with certainty with experts of the desired function of the automation also on the production side, so that the automation project can be carried out successfully. In case of possible problems, the necessary experts for the original process must be available, otherwise it is quite difficult to carry out the acceptance tests properly." (I4)

It would be good practice to stay in touch with how employees react to the adoption of RPA, and any issues that may arise with it. Although most people seem

to welcome successful RPA implementations with open arms, some fears may also arise when essential parts of someone's previous work tasks suddenly get automated.

> ” Thanks to the purchase invoice robot, secretaries who previously processed purchase invoices had significant amounts of time freed up. Of course, when some people had less work due to the robot, there were also fears for some people about whether they would be needed here anymore when such a large workload had been lifted off their shoulders. As I recall, one person even found it more inconvenient to have a robot take care of his previous work tasks, because he was afraid that they wouldn't go right when the robot did them. He found it inconvenient that he would have to check that the robot did its job correctly. However, I think this was more of a mental issue.” (I5)

The habit of naming software robots came up as an interesting side note while discussing the implementation process. Robots are often given familiar names in order to make it easier to talk about them and to dispel the cautious attitude towards robots and automation. Methods like this may be useful when familiarising and building trust towards the robots, if suspicions arise in employees who have to deal with the software robots.

> ” Yes, I would say that every place has a Robin or a Rami or whatever, and I think that's one way to dispel the fear of a robot coming and taking over our jobs. Because it's the kind of fear that has clearly become visible for us too. Here, however, everyone has an interest in the fact that robots make their jobs easier and free up workers' time for creating higher added value, because we are in a situation where there are more jobs than workers. Robots then help us not to drown ourselves under the workload. In addition to a more approachable name, I think it is also more effective to use language to talk about Rami, for example, than to always talk in slang about software robotics programs or something along those lines.” (I1)

> ” The robot's name was Oiva.” (I5)

4.5 Future of RPA & impact on controllers' work

According to the interviewees, over the past few years RPA has changed from just an interesting talking point to a well-established tool, the possibilities of which are seen in more and more processes. Nevertheless, the enthusiasm surrounding the topic of automation still does not always correspond to reality. But as the field of software automation advances, the realistic understanding of RPA capabilities also develops.

> ” In general, it must be said that there is a lot of buzz about RPA and intelligent financial management. However, practical applications vary; often there is much more hype than concrete use cases. Often, even where concrete advantages exist, the basic systems used have been lacking in essential parts. The software robot has then patched things up that higher-quality basic systems could also take care of by themselves. Of course, it is always individual in the company whether robotics becomes a business case or

not. Our company is perhaps even a bit behind in the use of RPA. In many companies, however, the subject has not been discussed much yet. In general, it can be said that in the field of financial management, RPA is increasingly and more widely being used. The operation of basic software robotics seems to be quite clear for most people by now." (I1)

" RPA has developed a lot since 2017, when I first started working with it. In general, many technologies have developed quite a lot. If at that time there were still only simple cases of the most common financial management tasks which could be automated, the application targets have expanded quite a bit since then. Lots more besides just the most traditional cases can now be automated. If in 2017 only some of the biggest companies were doing this work, now RPA is already starting to become "business as usual" in many places. Sometimes there has been more hype and sometimes less. Today, it is also better known what can and cannot be done with the use of RPA." (I2)

" In 2016, when I started working with RPA, the topic was interesting, but people didn't pick up on it. Now, however, the use of RPA is already more established, and we are already meeting customers who have started an RPA project with another subcontractor but are trying to switch to a more efficient subcontractor. So, there is definitely a need for RPA developers." (I3)

" Compared to 2015 when I started working with RPA, today we can clearly automate much more difficult and longer processes more reliably than before. The technologies themselves have not necessarily progressed much, but of course they have become more reliable." (I4)

" We started using automations little by little. We started with easier cases such as the sales receipt report, which was one of the first, perhaps due to being the easiest case because the report is just run from the ERP systems by pressing a few buttons, after which the data is organized a little in Excel and emailed forward. After that, we moved on to slightly more complicated cases, such as the accounting and processing of purchase invoices and payroll matters." (I5)

A major part of the advancement of RPA during these last few years does not seem to come only from the development of the technologies themselves, but in the ways organizations and the whole field have learned to pivot those pre-existing technologies. Due to the grown RPA expertise of organizations and their experts and the increased reliability of the software used as well as new ways of operating, companies are now able to tackle larger and more complex challenges than they were before. This kind of progress is expected to continue as the field matures and will hopefully be able to respond to the kind of progress that the business controller interviewed was hoping for.

" In addition to technological development, the courage to make bigger and longer automations has grown thanks to significantly developed maintenance services, for instance. Today, we can therefore rely on being able to automate much longer and more business-critical activities. So even though RPA products have not developed by huge leaps, what we can do with them has developed a lot. The entire industry has developed immensely; seven years ago, no one even properly maintained automation when compared with today's standards. Back then, pilots and small things were done

> to get things going, but now the industry has moved forward a lot from those times." (I4)

> " I would hope that the automation of financial administration would also move to more challenging tasks, because I feel that sometimes there are still quite a lot of processes where the robot cannot read a file, for example, or a problem is too complex for the robot to solve easily. I hope that it would be possible to automate even more challenging tasks that are currently not completely clear-cut. Of course, all kinds of great Business Intelligence systems could, over time, change the functions so that there would no longer even be any problems that would need to be solved by a robot, when data would no longer need to be rotated in, for example, Excel." (I5)

Further development opportunities for RPA are seen, for example, by combining machine learning and more advanced image recognition with it. Machine learning would be useful especially in cases where the robot could predict the information in empty data fields with sufficient certainty to be able to continue working independently despite missing information. However, these kinds of solutions are, at least for the time being, remarkably expensive and laborious, which is why they are not yet very common. One way to detect further development targets for software robots is to monitor which tasks have the most manual work left over, which the robot cannot handle by itself. From these cases, we can then investigate in more detail what the robot would need to know to perform the tasks independently. Recently, open-source RPA has also started to become more common, which may contribute to accelerating the development of the field, at least in smaller scale automation projects done independently from larger IT consulting organizations.

> " In another function, we have a project in development that combines image recognition, RPA, and more. The price tag is much higher for such projects, which is why similar projects have not yet been undertaken in our financial department." (I1)

> " Intelligent automation, where machine learning is combined with RPA, has thus far appeared mostly only in advertising speeches. There are still very few cases where a software robot is able to fix itself when it encounters problems. However, it is already possible in some cases today. For example, when a robot processes data in Excel, if it encounters an empty field where there should be information, it is possible to develop a machine learning model, which predicts the likely missing information with the help of other data. If the certainty of the prediction were above a certain limit, the robot could fill the empty field with the prediction and continue the process using the generated information. If the probability was not very high, the robot could stop or skip the task at that point. It would be possible to build applications like this, but despite all the hype, they are still quite rare." (I2)

> " In the past, the technology in question has only been under the control of a few commercial players such as UIPath and BluePrism, but in recent years, open-source RPA development has also started to rise and grow. Their level is already starting to be competitive and, in many places, even better than similar commercial software. It will be interesting to see if it really starts to take over the market or not." (I2)

Even with the current technological toolset, of which RPA is just a small part, more financial functions could possibly be automated with a change of perspective. For now, many automations have focused on automating singular tasks using a bottom-up approach, while it could prove beneficial to use a top-down approach in a larger scale, considering the major goals of business functions and how those goals could be achieved most efficiently, instead of simply looking at the current process and replacing it with an automated solution.

> ” The financial administration automations that I have personally been involved in have always started from the goal of what should be accomplished and how to achieve it, and when everything is regulated, we just start thinking about where any necessary information can be collected. In other words, we have started to think backwards about the goal, what should be done to achieve the goal. This has been a convenient approach to automating individual financial management processes, but in the same way, you should also start thinking through larger workflows that can be automated in small chunks, eventually building larger rationally automated entities from them.” (I4)

RPA had not reduced the number of jobs in any of the employer companies of the five interviewees. In contrast, the increased demand for automation consulting and development had even increased the number of employees in the companies of four interviewees, as their industry includes IT consulting and software development. One company was even founded with the sole focus of developing intelligent automation solutions.

> ” On the financial management side, robotics has not affected the number of personnel such as controllers. Software robotics is just one tool in the kit, and process experts participate in development projects in teams in addition to their other tasks. The impact on working time has been so small that the need for more resources has not arisen. Nor has any robot completely replaced a single worker. As mentioned above, there would be more work for us than there are workers.” (I1)

> ” At least it hasn't cut jobs, but there is certainly a demand for RPA for a company doing consulting work. We have hired a few people to do RPA consulting work. So, it has slightly increased the number of employees, but it is not a significant business for us, because we do so much of everything else.” (I2)

> ” A couple more guys were just recruited, and applications are open again. We already have to turn down some customers because there is so much demand for RPA. Since last fall, there has been a steady increase in work, while in the past the situations have fluctuated between rush peaks and idle time due to demand. For example, at the moment there is enough work for many months to the future.” (I3)

> ” At least for our organization which focuses on automation consulting and development, RPA has created hundreds of jobs. When I think of our customers, I can't think of many organizations that have reduced staff due to automation. Certainly not all organizations have recruited a new person to replace every employee who retires or leaves the job, but despite that, at least on the Finnish scale of things, I believe that we have created more jobs with this industry than we have reduced them. After all, nowadays every large organization has at least one or two people working on automation. So, the number of employees does not seem to have decreased, but with the same number of personnel, more can be achieved thanks to RPA.” (I4)

> ” In no way do I feel that RPA would have a negative impact on the number of jobs, at least in terms of business controllers. After all, in my opinion, the most important task of business controllers is to focus on the future and thinking work regarding what is valuable for the company. That is precisely the type of analysis and other work that RPA cannot do. I would say that around 95% of my work is something that no robot could possibly do at the moment. However, RPA will certainly have a greater impact on the work of people who do a lot of manual work, for example accounts payable managers who process purchase invoices. It could perhaps be a role that RPA would negatively affect in terms of workload.” (I5)

Instead of reducing the number of employees companies have working for them, the interviewees believe that RPA is mostly used to achieve more with the same amount of people as before. This is partially explained by employees' job descriptions transforming into tasks which add more value to the business, but one explaining factor could also lie in the fact that in many cases organizations either can't or won't yet rely completely on the perfect functioning of the robot. Despite this, many organizations already seem to rely heavily on RPA to get their current tasks done.

> ” The status quo simply seems to be that more can be done with the same team using RPA, because if plausible challenges with the robot arise, the work previously handled by the robot should in any case be managed in some way. For the time being, however, the confidence to be able to trust the automation to always and reliably perform the tasks set for it is still quite low. Despite that, there are already many organizations in Finland that would no longer be able to perform their current tasks if all the software robots stopped working at once. Many FTEs have already been automated in Finland.” (I4)

Views on how much automation potential exists in financial management and specifically in the current job descriptions of controllers seemed to vary quite a lot depending on semantics of the term controller, as well as with the person being interviewed. In general, people working mostly on the IT side of things seemed to have stronger beliefs of automation potential still available in these tasks, while the business controller interviewed emphasized the analytical and business advisor side of the modern business controller job descriptions. Perspectives also seemed to vary depending on if the business functions were considered from a general or a more detailed perspective. One interviewee believed that many current financial management processes could be automated a whole lot further, but it would require a complete rethinking of the processes we use to achieve the business goals required today. Especially the tasks which are defined by legislation, regulations and standards would be the most viable for more holistic automation.

> ” I think that we have only scratched the surface when it comes to the automation of financial administration. Many other industries have begun to change the operations themselves more, but in my opinion, in the field of financial administration, they have not yet begun to implement a more comprehensive change, mainly things have been automated here and there and only first experiences have been sought thus far.

> I would argue that over time, in the field of financial administration, it would be possible to automate pretty much all such tasks that are based on laws, regulations, standards and ways of doing accounting, for example. The pattern should be exploded and look at, for example, the financial management of an entire unit and start building the processes in such a way that they could be automated. Even now, of course, there are already big accounting firms that have gone out to get the business from smaller clients for themselves by saying that when you provide us with the necessary information in this format, we will process it all automatically and thus you will get these services cheaper. That is, they set requirements for their customers, and then handle the data processing with their robots or systems without the need for a person to be actively involved in the work. This is exactly the type of activity that would be necessary to implement automation beyond current practices in financial management." (I4)

One possible driver for further automation of financial processes, including tasks traditionally considered belonging to controllers, would be legislative changes which would standardize the financial functions of organizations even further. According to one interviewee, this topic has been on the table for quite a while, and it could be possible that actors such as the EU could implement something like this further down the line. If these functions would work in similar rule-based ways in most major companies, it would become viable to develop IT systems with a completely different philosophy compared to e.g., our current ERP systems, which are tailored for specific companies and which have to be developed with the human end-user in mind.

> " One topic that has already been talked about for a long time is that financial administration systems and processes would start to use the same standards across the board in the production and processing of reports and logs. It's probably something that wouldn't suit consulting houses or auditors or software houses, but I don't know if the EU is going to push this through at some point. After all, that would make everything possible: complete automation of auditing and all the functions you can imagine, as well as changing current systems to completely different solutions. So, in my opinion, comprehensive advancement of the automation of financial administration would require blowing up the current processes of financial administration." (I4)

In the future, the need for technological expertise will continue to grow in controller roles, as well as in many other areas of business. Individual employees will probably have more responsibility and power than before, which means that the ability to manage oneself must develop in order to keep up with the times and the development of technology. However, one cannot forget the vital substantive expertise required in one's own special field. Even if you don't have any special expertise in automation, it would still be good to understand the opportunities it creates in making your own work tasks easier. You don't necessarily need to know things technically, but it's good to know what RPA is and how it works on a general level. Thus, you can also understand what kind of tasks it could be assigned. And just like with macros now, workers could in theory learn to automate small bits of code by themselves, as long as it is approved, and they monitor the quality of their own solutions with extreme care.

> ” You can be very good at software robotics or any IT technology, but you also need to know how to tell the robot what it needs to do and why: the core competence of financial management must also be at a high level. Without it, everything else is pretty much pointless.” (I1)

> ” It is good to understand at some level what RPA and other automation technologies are, so that it would be easier to identify and advance ideas about tasks that could potentially be automated, instead of doing your work "with your eyes closed", believing that the process could not be developed.” (I2)

> ” If you have the enthusiasm, you can also learn to make small bits of code yourself to automate your own work.” (I3)

The interviewees agreed that automation is constantly increasing in our society. This also has an impact on the employee's skill requirements in those positions where automation is applied. For example, the focus of process experts on handling exceptional cases has emphasized the skills required for the most challenging issues, while the robot handles basic cases independently. In order to solve a robot's problem, you also need to understand what and how it has done something. As for business controllers, in the future they may need to begin focusing even more on the advisory side of their tasks, where the skills required for planning and predicting for the future becomes much more important than keeping present functions up and running. These are exactly the kinds of tasks that aren’t very easily automated, where human intelligence gets to shine.

> ” There must be a basic understanding of what "pressing the system button" causes, as well as how it will affect. Creating this understanding is important.” (I1)

> ” All kinds of manual and routine work will become largely automated over time.” (I2)

> ” As automation increases, controllers must develop to meet more challenging tasks. In my opinion, the role of business controllers today is to act as a glue or a pillar between businesses, and to act as a financial advisor. We have to know quite a lot about everything in this role, not only from the financial side, but also from the business itself and have a really deep understanding of various topics. Robots cannot gain a similar understanding. When we move to the situation where the work of business controllers no longer includes much manual data processing or similar routine work, I think that business controllers also develop much more personally in their own work, when they do not have to spend time on something that does not particularly require anything from them professionally. Then they really have to focus on more challenging tasks that require harder thinking, concentration, and development. This way you also develop more professionally.” (I5)

5 CONCLUSION

5.1 Finishing thoughts

As mentioned earlier in the introduction, the applications of automation are increasing at a rapid pace (Frey & Osborne, 2017). The work can be both optimized and made more meaningful by various means of automation, of which RPA in particular has recently been widely presented in the context of financial management due to its simplicity and ease of deployment, and because there is a plethora of suitable uses to be found for it in financial tasks (Bolinger, 2017; Brands & Holtzblatt, 2015; Kaarlejärvi & Salminen, 2018; Kokina & Davenport, 2017; Lawson, 2019; Moffitt et al., 2018, 2018). The main objective of this study was to answer the question: "*Which controlling tasks should be automated with the use of RPA?*" The material collected for the study provided practical answers to the question as the experts shared their own experiences of utilizing and developing RPA in controlling related tasks. According to the experts interviewed, the routine tasks of financial administration which many controllers would otherwise often face are increasingly being performed with the assistance of a robot: some tasks are partially performed by a robot while still having a human in the loop, and some tasks are done completely independently by the robot. However, automating controllers' tasks isn't usually top priority since they have a relatively low volume. Working as a financial adviser and assisting in decision making is a major part of many controller roles, which means that many of their current tasks cannot be automated very effectively, at least not with RPA. According to the experiences of the interviewees, applying automation such as robotics to information work allows various office work tasks to be completed faster and more accurately, leaving people more time to perform the tasks which are more meaningful and require more human consideration, helping to further develop their company's business. Especially well-defined and high-volume routine tasks are profitable applications for RPA. Such processes can be found, for example, in the

fields of data validation and review, invoicing, and customer collection automation. The interviewees' views on the features of applications suitable for RPA and the benefits achieved by them were very similar to the literature presented in the second part of this dissertation (Alho et al., 2018; Asatiani & Penttinen, 2016; Bichler et al., 2018; Kaarlejärvi & Salminen, 2018; Lhuer, 2016).

The introduction also introduced two sub-questions related to the topic: *"How can a company implement RPA?"* And *"How will increasing automation affect the role of financial controllers?"* Empirical evidence suggests that the successful completion of RPA deployment projects requires, first and foremost, a sufficient understanding of the types of processes that RPA can be used automate, as well as a clear idea of what exactly is being automated and why. If there is no expertise to develop a software robot inside the company, the RPA development project can be "botsourced", meaning that the necessary RPA development expertise may be purchased from various IT service providers outside the company (Hofmann et al., 2020). According to the interviewees, buying RPA solutions from a robotics supplier is very common. However, there must also be sufficiently skilled and knowledgeable human resources such as subject matter experts of the original processes, and enough commitment to the robotization project from the company's end where robotics is going to be implemented. The software robots must have a person in charge of them inside the companies that utilizes them, because the robot cannot function forever in changing systems as it is when it is first deployed without further development to respond to eventual system changes. According to both the interviewees and pre-existing literature, a smooth flow of information between the finance and IT departments plays an essential role in ensuring successful RPA implementation (Hofmann et al., 2020). As RPA becomes more widespread, the ability of process experts to handle process exceptions is emphasized, as the robot can usually only perform routine tasks and maybe some of the more common exceptions. Controllers will also be able to focus more on the analytical advisory parts of their role. In the future, it would be good for controlling professionals to develop a sufficient understanding of the possibilities of automation to realize which tasks would be more sensible to perform by means of automation instead of mindlessly executing them by manual human work. There is no need for all controllers to understand RPA-related matters at a very deep technical level, but it is still good to know what RPA is and how it works at the general level. This way, one can understand what kind of tasks it can be entrusted with and what it cannot. As the level of automation increases in our society, the responsibility and power of individual employees may increase over time. Therefore, the ability to self-manage must develop in order to keep up with the development of technology, without forgetting the hard substance expertise required in one's own field of work.

The theoretical framework section of this dissertation mentioned similar features that make processes suitable to be automated with RPA as the features which were highlighted by the interviewees. Based on both empirical data and previous research, RPA is best suited to perform routine tasks for which precise rules and guidelines can be defined (Alho et al., 2018). In previous studies, many

similar use cases emerged as did in the empirical data of this thesis. For example, billing and data verification between different systems are such processes which can be automated with the use of RPA relatively easily. (Kaarlejärvi & Salminen, 2018, pp. 53–55.) In addition to the various use cases mentioned in the theoretical framework section, the utilization of RPA in customer collection also emerged from the empirical data mostly due to the vital business role of the process, and not so much due to just pure man-hour savings. In the empirical material, the application targets were described in more detail than just on the general level, which helps to bring the discussion about RPA from the general level more to the practical level. For example, a quarterly pre-payment registry check of suppliers is a very practical and specific example of the usage of RPA, which was brought up in the interviews. The interviews also identified concrete ways to assess the benefits of implementing RPA, for example by comparing the workload of a software robot to the workload required of full-time employees to achieve the same result, and the estimated service life of the software robot.

Previous research has presented mixed views on the importance of the role of one's own IT department in the success of RPA processes. Although in theory users can develop the necessary software robots themselves (Aguirre & Rodriguez, 2017), this type of activity did not appear to be very common nor advisable according to the interview data of this study. Admittedly, interviewees mentioned the possibility, but in general, interviewees had the view that RPA projects require active collaboration between finance and IT departments (Hofmann et al., 2020), suggesting that IT participation is crucial, and people who are not well versed in IT independently developing their own robots may carry its own major risks and issues. However, one of the interviewees did mention the growth of "civic development" and open-source RPA, so the requirement of tightly controlled development projects with strong IT involvement may become less critical in the future, at least in the case of very small-scale implementations.

In pre-existing literature, the impact of RPA on the job description of e.g., controllers or accountants, was assessed to be much more significant than how the interviewees interpreted the matter. This suggest that there is still some hype around the subject of RPA in literature that does not have strong realistic basis, at least not with the current level of knowledge and technology. There are many views in the research world that business controlling activities are slowly but steadily changing from current operational tasks to a more strategic and value-creating direction. According to Lawson (2019), these new responsibilities would include more tasks such as improving business understanding, for example, by evaluating, analysing, and interpreting the information that is available. According to the interviewees, some evidence of this kind of progress can already be seen. Executing routine tasks becomes a less relevant aspect of controllers' job description with increasing automation over time, and some employees may gain more responsibility because of it. Another significant potential change in the controller job description was seen in the requirement to increase the understanding of controllers on which tasks should be automated so that existing processes could be developed further.

RPA has only begun to become a significant knowledge work tool during the last 6-7 years, so its future role in controlling cannot yet be accurately assessed. However, its use seems to be spreading at a rapid pace at the moment, which may mean more meaningful work for all of us as the workload induced by routine and repetitive tasks decreases. As Leslie Willcocks, the professor of technology, work, and globalization at the London School of Economics' department of management said: "In the longer term, RPA means people will have more interesting work. For 130 years we've been making jobs uninteresting and deskilled. The evidence is that it's not whole jobs that will be lost but parts of jobs, and you can reassemble work into different types of job. It will be disruptive, but organizations should be able to absorb that level of change. The relationship between technology and people has to change in the future for the better, and I think RPA is one of the great tools to enable that change." (Lhuer, 2016.)

5.2 Study limitations & further research topics

The research material consisted of five interviews conducted with people working with RPA in Finnish companies. The material of the study is therefore very small, and the results of the study cannot therefore be generalized to the situational picture of RPA in the financial management of companies on a wider scale. Of course, this was not the goal of the study, since as is typical for qualitative research, this study instead focused on the development of new insights and understanding (Taylor et al., 2016, p. 165).

Since all of the interviewees work in Finland, the survey did not reveal many views on the use of RPA in financial administration outside the borders of Finland, although at least two of the interviewees work in companies that develop automation for customers outside of Finland as well. The interviewees had started worked with RPA between 2015 and 2017, and according to them, big changes have been seen in the field already during these five to seven years from their first steps with RPA to the time this thesis was written. Since RPA is still such a new technology, it will be interesting to see how established it is and in which processes its use will eventually become commonplace, and where traditional IT system development projects remain as a more viable option. Another thing to keep in mind is that RPA is only one of the intelligent automation solutions available, and similar or more developed tools which are used in the future may carry different names. Since all the interviewees work close to RPA themselves, they are probably much more aware of the possibilities of the technology in question compared to the average person. If the study had interviewed five randomly selected people working in financial administration without ties to the development of RPA, the picture of the importance of RPA in the tasks of financial administration may have been considerably different.

In this study, the possible uses of RPA were only examined without delving further into the quantitative measurable benefits that can be achieved with it in different tasks. Therefore, one interesting subject of further research would be to

find out all the key metrics of the benefits achieved with RPA, which companies are using. Using standardized key performance indicators for RPA, the comparison of different applications would become more meaningful. In addition, it would be interesting to understand the generality of the use of RPA in the financial units of Finnish companies, for example through a survey conducted with a comprehensive sample. A survey carried out in different years could also provide an overview of the generalization of the use of RPA over the years. The interviewees also brought up the possibility of using machine learning to make software robots use probability calculations to fill in missing gaps or errors in information, and it would be quite interesting to know whether these kinds of solutions have become more economically viable and commonplace in the future. As automation of information work becomes more widespread, it would also be interesting to find out about the achieved performance differences and price tags between different automation solutions, so that further development work could be focused on the most optimal automation solutions which use up the least resources.

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APPENDIX 1 INTERVIEW FRAME

1. Interview frame

- What is robotic process automation or RPA?
- What features make a process suitable for applying RPA on it?
- What kinds of controlling / financial management related tasks should RPA be used in?
- Please provide an example case of implementing RPA in a financial management task. On what basis was it chosen as the appropriate tool, and how did the deployment process proceed?
- What is required for the successful implementation of RPA? (Competence in the organization, attitude atmosphere, external services, time, resources, etc.)
- Has RPA been worth applying in the cases you have participated in? Why?
- Has RPA affected the number of jobs available in your organization?
- What happens when a software robot encounters a problem that it can't solve by itself?
- Can software robots be trained to improve in their tasks? How?
- How has software robotics evolved since you first became familiar with it?
- In what direction do you think the automation of financial management will develop in the next 10 years?
- Will increasing automation transform the competence requirements of knowledge workers? If so, how?