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Utilizing Robotic Process Automation for Hybrid Workforce in Finance and Accounting Operations

Arja Leivonen

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Anne Mäntysaari

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Tiivistelmä

Ohjelmistorobotiikka (RPA) on kasvava teknologia taloushallinnon toiminnoissa maailmanlaajuisesti. Tärkeimpiä syitä RPA:n hyödyntämiseen ovat tehokkuushyödyt sekä ulkoistamisen purkaminen. RPA:n käyttö ei tarkoita sitä, että kaikki työ annetaan tietokoneille. Ihmiset tulee ottaa mukaan RPA:n käyttöön ja muodostaa hybridityövoima, joka sisältää ihmiset työntekijöinä sekä digitaalisen työvoiman.

Tutkimuksen tavoitteena oli selvittää, mitkä tekijät vaikuttavat RPA: n tehtävien valintaan ja oikeantyyppisen RPA-ratkaisun valintaan. Tutkimuksen käsitteellinen viitekehys keskittyi prosessien automatisointiin, jossa keskityttiin erityisesti RPA: n käyttöön. Kirjallisuuskatsaus tehtiin hakemalla Internet-hakupalveluiden avulla tieteellisiä julkaisuja aiheesta. Empiirinen lähestymistapa oli selvittää, miten taloushallinnon tehtäviä voidaan jakaa erilaisten RPA-robottien ja ihmisten välillä.

Tutkimusmenetelmänä oli laadullinen tutkimus. Tutkimustiedot kerättiin haastatteluista ja asiakirjoista. Haastattelut suoritettiin puolistrukturoituina. Kaikille haastatelluille esitettiin samat peruskysymykset, mutta keskustelut johtivat eri suuntiin riippuen haastateltavien kokemuksista ja osaamisalueista. Tämä varmisti tietojen laajuuden tutkimuskysymyksiin nähden. Tutkimusasiakirjat saatiin haastateltavilta. Tutkimustietoja analysoitiin temaattisesti, ja käytettiin jatkuvan vertailuanalyysimenetelmän komponentteja. Analyysin tavoitteena oli tunnistaa tutkimusdatasta toistuvia malleja.

Vastaukset tutkimuskysymyksiin muodostuivat kirjallisuuden ja haastatteluista saatujen tietojen perusteella. Lopputuloksena tutkimuksen pohjalta suunniteltiin työkalu tehtävien arvioimiseksi harkittaessa automaatiota RPA:lla.

Avainsanat (asiasanat)

Ohjelmistorobotiikka, Robotic Process Automation, Digitaalinen työvoima, Hybridityövoima, Prosessiautomaatio

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Abstract

Robotic Process Automation (RPA) is a rising technology in finance and accounting operations worldwide. The main reasons for applying RPA are efficiency benefits and insourcing. The use of RPA does not mean that everything is left to the computer. People should be involved with RPA as a hybrid workforce containing both human and digital workforce.

The objective of the study was to examine which factors influence on choosing tasks for RPA and on the choice of the right type of an RPA solution. The conceptual framework of the paper focused on process automation with key focus on the use of RPA. A literature review was conducted by using internet search services for scientific publications on the topic. The empirical approach was to explore how to allocate finance and accounting tasks between attended robots, unattended robots and humans.

The chosen methodology of this study was qualitative. The research data was collected from interviews and documents. The interviews were conducted as semi-structured. All interviewees were asked the same basic questions, but the conversations led to different orientations depending on the experiences and areas of expertise of the interviewees. This ensured the extent of the data considering the research questions. The documents were received from the interviewees. The research data was analyzed thematically, and components of the constant comparative method of data analysis were used. The object of the analysis was to identify patterns in the research data.

The answers to the research questions were formed based on literature and the data gained from the interviews. As a result, a tool for evaluating tasks when considering automation with RPA was designed based on the study.

Keywords/tags (subjects)

Robotic Process Automation, Digital workforce, Hybrid Workforce, Process Automation

Miscellaneous (Confidential information)

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1 Introduction

In the 15th century Italy, Luca Pacioli introduced a double-entry accounting system that is still in use today. The accounting was done manually until the end of the 19th century, when the first mechanical calculators were invented. However, in most companies accounting was done mostly with tape calculators until the 1980s, when the proliferation of personal computers shifted finance and accounting towards automation. With the development of hardware and software, accounting first moved from paper to computer-aided work and quickly to electronic systems. The first leap of automation occurred when the development of computer networks and software enabled the transfer of machine-readable data between computer systems. The use of software and automation enables handling large amounts of transactions efficiently and it increases productivity. (Heikkinen 2017.)

Progress continues and the next industry revolution is the automation of processes. Robotic Process Automation (RPA) has its origins in the early 1990´s screen scraping and workflow automation tools but the term Robotic Process Automation dates back to the early 2000´s. (Ostidick 2016.) The RPA robot is not a physical robot but a software. Willcocks and Lacity (2016) describe RPA robot to be *"an infinitely scalable virtual human that can be instructed very quickly in order to carry out operational procedures at the speed of a machine".* RPA suits for tasks where there is an input of data from one system and where the data is then transformed following structured rules and then passed to another computer system. For example, there can be data collected from an email, transformed in an Excel file and outputted to an ERP system. RPA enables the automation of processes in a way that there is no need to change the existing information systems, as the robot uses the same programs in the same way as people do. RPA´s value compared to the preceding technologies is the graphical user interface. Graphical user interface enable a visual way for users to develop automation and manage workflows without coding knowledge by using drag and drop features. In RPA parlance, a RPA robot means one RPA software license. (Ostidick 2016, Willcocks & Lacity 2016, 65-70.)

RPA is a rising technology worldwide. The main reasons to apply RPA are efficiency benefits and insourcing. Efficiency benefits are realized when a simple manual task is done by a robot faster and rightly. A robot is not bound to certain working hours but they can be determined according to the needs of the organization, and the robot performs the tasks just as it is programmed to perform them, without discretionary errors. Insourcing means that the organization can bring the previously outsourced work back in house (Schniederjans & Schniederjans 2005, 3). The work can be automated with RPA because the costs of RPA are usually lower than the expenses of outsourcing. RPA can still be used alongside and together with the future technologies of artificial intelligence, which makes it a versatile tool for automation also in the long term.

The use of RPA does not mean that everything is left to the computer. The robots can perform some of the same tasks that people are currently doing but not all kinds of tasks. Helpsystems (2017) describe a digital workforce to be "*a scalable team of software robots that supports and augments the work that your human employees are doing*." In some cases, it is more beneficial to automate the entire workflow, which will discharge human workforce to conduct more strategic, high-value work. Other situations demand humans and software robots to work side-by-side, as RPA robots interact with humans, who initiate and control robot tasks. (Helpsystems 2017, UiPath 2017.) There is still a need for people in working life, including finance and accounting administration. People should be involved with the RPA as hybrid operations with human workforce and RPA (Nakayama 2017).

Finance and accounting has traditionally been the community of people with strong expertise. Currently robots have become increasingly involved in work alongside people, and software robots and people together can be called hybrid workforce. Some tasks in finance and accounting processes are more efficient when fully automated with RPA, but sometimes robots can play a more assistive role. There are also many tasks that require human decision making, which means that they cannot be automated. Prior research on and the theoretical foundation of the phenomenon is scarce, as the research subject is new and has not yet been researched widely. The aim of the study was to examine the factors influence on choosing tasks for RPA and

the choice of the right type of an RPA solution. The outcome should reveal the potential combination of humans and robots in finance and accounting tasks for attaining an effective hybrid workforce. As a result, this research gives a tool for the evaluation of tasks when considering automation with RPA and for helping the decision making. This research was assigned by an organization, later referred to as the client organization, to which the author does not have prior dependences. The main research questions were:

What makes a task suitable for RPA?

And:

What factors influence the choice of the suitable type of RPA solution?

These questions formed the basics of this study, and they are revisited in the discussion section. The questions form a temporal continuum. After understanding whether a task is suitable for RPA, the suitable type of RPA can be evaluated. The research focused on finding the factors influencing how to use hybrid workforce on tasks in finance and accounting processes. The research was based on the studies of RPA, process automation and process identification. Processes were evaluated on the task level, and the purpose of this research was to discover the potential combination for a hybrid workforce. As a result, a model for evaluating tasks for RPA was developed, based on the literature and the interviews.

The conceptual framework of the paper focuses on process automation, with key focus on the use of RPA. A tool for defining a task for automation was developed based on the literature, interviews, and the research documents. In line with the conceptual framework, the empirical approach was assumed to explore how to properly allocate finance and accounting tasks between attended robots, unattended robots and humans. The Literature review was made by browsing through internet search services for scientific publications on the subject. The search services were JAMK Janet, Google Scholar, Emerald Insight and ProQuest. It became clear that RPA had not

yet been scientifically studied very extensively, and to explore the field more, the information collected from different RPA suppliers and expert interviews was added to confirm the information found in the studied unscientific sources.

This thesis is divided into the literature review in Chapter 2, research methods in Chapter 3, empirical research in Chapter 4, and results and discussion in Chapters 5 and 6. Chapter 2 contains a literature review about process automation and RPA. Process automation is considered to start with a process description and how it is used in the automation process. The chapter also includes a review about RPA explaining what it is, how it works, how it is determined, and what the benefits, risks and demands for the processes are. Chapter 2 also describes what are the special features of attended and unattended RPA are as well as the human roles in the overall picture.

Chapter 3 focuses on justifying the chosen qualitative research method: a qualitative case study with a twist of grounded theory. The chapter continues by describing the methodology more specifically. The methodology consisted of data collection with semi-structured interviews and analyzing documents with thematic analysis. Chapter 4 contains the empirical part of the research. The information from the data collected was used to describe the liaison of attended RPA, unattended RPA, and human workforce when considering the hybrid workforce. Chapter 5 presents the results of the research, and it includes a tool for evaluating the tasks for RPA. The tool is based on the literature and the interviews. Assessment of the research, answers to the research questions, and the validity and competence of the research are part of the discussion in Chapter 6. The chapter also considers topics for future research in the field of this study.

2 Process Automation and RPA

2.1 Process automation

A process is a set of activities that receives and transforms one or more inputs and generates one or more outputs. The term activity is a generic term for any sub-process. An atomic activity or task refers to the smallest process that can be chosen to a model by using the same process diagram symbols. (Harmon 2014.) A process or activity should have someone who is responsible of the process. A process manager is responsible for accomplishing the process with the resources that it needs and for ensuring that the employees know and perform their jobs and receive feedback. (Harmon 2014.) When modelling processes, the first task is to define what the process is all about and to specify and describe the purpose of the models as well as and the situation for which the modelling is carried out (Luukkonen, Mykkänen, Itälä, Savolainen & Tamminen 2012, 54). When the subject is marked out, reliable information is needed about the current state of the process. Information is collected from the existing process to illustrate the implementation of the process. (Martinsuo & Blomqvist 2010, 6-15.)

Formal process diagrams can be called process maps, activity diagrams or workflow diagrams. There is a wide variety of different diagramming notations to describe processes, as they are often used in different causes. (Harmon 2017.) A process modelling level defines how precise and detailed the descriptions are (Luukkonen et. al 2012, 54). For example, business managers can use informal diagrams to demonstrate how a complex process works, while an IT group will create a formal process diagram as a first step in a project to automate a process. The purpose of a precise formal process diagram is to specify how the process can be implemented by a software program (Harmon 2017).

When planning the use of Robotic Process Automation, it is essential that the models are sufficiently comprehensive, detailed and formal (Luukkonen et. al 2012, 54). The detailed process description distinguishes measurable and instructive tasks and interdependencies between tasks, as well as roles and responsibilities in the process. The

tools and information required in the process can also be described. If the process is to be carried out always in the same way, a detailed description is necessary. (Martinsuo & Blomqvist 2010, 6-15.)

Business process modelling tools can support many different notations, and it is not so important which notations are used. However, it is important that they are used consistently. (Harmon 2017.) The next step after the description is to identify the areas where the process can be developed and renewed, or sometimes where even the entire process can be redefined. The target process is modelled as the process should take place, and the modelling is tested to monitor the implementation of the process and to make modifications and corrections. If the process is complicated and the actual testing is not possible, the testing can be done by asking the experts´ views involved in the process about the correctness, disadvantages, and development needs of the process. (Martinsuo & Blomqvist 2010, 6-15.) Finally, a detailed process description document is made (Luukka 2016).

Process mining is a method where data, which is collected from various information systems, is used for analysis (Shelke 2018). Event logs collect digital footprints that are received from the systems. (Uipath 2017a). Data from the event logs contains information about how the process is carried out systemically. The unused data can be utilized using the data mining methods, and the data contains the exact information on how a process is actually carried out in the real world. (Shelke 2018, Uipath 2017a, Nominacher 2018.) Process mining is enhancing or extending existing process models by using additional data from the recorded logs (Kerremans 2018). Process mining supports the visualization of how processes contribute to business value, such as business operating models (Kerremans 2018).

A visual blueprint of a business process is a description about the process and how it performs in the system and it displays clarity on the steps that need reforming (Shelke 2018, Uipath 2017a). Process mining can give different perspectives on operations, for example, a resource perspective or other organizational constructs, such as partners, channels or departments (Kerremans 2018). The process mining technology uncovers the data that exists in the systems and makes the inefficiencies and

bottlenecks visible as well as identifies the root causes in the business process. The process mining can unfold how the process has been working, what level of complexity it involves, what are the exceptions, and how mature that process is for automation. Evaluating more complex business processes still requires manual mapping, observation and clarification. (Uipath 2017a)

Once the process has been defined, it is critically examined. This means establishing whether it is possible to improve the process, discover bottlenecks or other problem areas as well as whether it can be intensified and accelerated. Moreover, decisions can be made on whether certain steps that have been running in succession could be done simultaneously. Time limits also need to be determined accurately. The refinement phase clarifies which parts of the process can be automated. (Luukka 2016.) The process must be standardized and defined so that it can be automated. Although it would appear in advance that automation could be useful, it cannot be seen clearly before the process is defined. (WNS 2016.) The instructions for the robots need to be very detailed. Breaking processes down into smaller shares and using interactive diagrams that enable layering of sub-steps of the task can be used for visualization. (Lowes, Cannata, Chitre & Barkham 2017, 12.)

2.2 Robotic Process Automation

Robotic Process Automation, "*RPA is an umbrella term for tools that operate on the user interface of other computer systems in the way a human would do*" (van der Aalst, Bichler & Heinzl 2018). RPA is a way to automate repetitive and rules-based processes as it imitates a human executing the process. RPA software uses existing technologies and systems to perform transactions, and an RPA robot can work on multiple processes and across multiple functions. For example, it can work on the finance process in the morning, HR process in the afternoon and master data set up process at night. (Lawson 2016, 3; Sengupta, Mehta & Dadu 2017, 7.) An RPA robot is integrated across IT systems via the front-end, and it uses IT systems like humans do, as traditionally software communicates with other systems back-end. The front-end,

i.e. the user interface, means that it is possible to integrate RPA with almost any software used by a human worker, without changes in the IT systems. (Asatiani & Penttinen 2016, 68.)

The emergence of the term “robotic process automation” can be traced to the early 2000´s (Ostdick 2016). RPA is based on Business Process Management (BPM) as a procedure and positioned as a new approach to conduct business process automation. RPA is not considered as a new core technology, but a combination of technologies. (Berkley 2017.) The key antecedents of RPA are screen scraping software, workflow automation, and management tools. RPA combines, refines, and reimagines features of these technologies. The gap between the current systems and legacy systems was first filled with screen scarping. Recently the use of screen scarping has been focused to extracting online data on the presentation layer. The workflow automation software can, for example, capture data fields and translate them into an organizations database, which reduces the need for manual work and improves quality, so that the benefits include increased speed, efficiency and accuracy. Although screen scraping outperforms human workforce in benefits, the challenge is the limited compatibility with the existing systems as well as the dependence on the HTML code which makes it challenging to understand for people with no prior coding experience. (Ostdick 2016.) With the use of RPA, other technologies, such as Optical Character Recognition (OCR) and Image Recognition have been included to the process automation, and with RPA they are able to adapt to varying websites without human intervention. (Berkley 2017, Ostdick 2016.) RPA is based on the technologies of screen scraping and workflow automation and as RPA evolves also these technologies can raise to the next level. (Ostdick 2016.)

Environment

RPA software usually consists of three parts: the tool for the programming, the robots, and the controller (or orchestrator) to master the robots. The systematic instructions for the software robot to follow to operate the process are determined with the RPA tool. (van der Aalst et al. 2018). The systematic instructions for the robots. The tools focus on the ease of use, so that users without prior coding

knowledge could use them. The “Drag- and-drop” functionality with simple configuration wizards are frequently used. Some tools also contain a process recorder that can be used to record user actions. The software robots carry out the instructions, operating directly with business applications to process the transactions. The actions that a robot is capable of performing rises over 600, and actions can also be tailored. (Lowes et al. 2017, 11-12.)

The robot controller manages automations, it contains version control and the master repository for the tasks, and it stores credentials for applications. The requisite information is granted to the robots in an encrypted form. To streamline the user management, the robot controllers can be integrated with mail servers or other applications. Operational management is supported by assigning authorizations and providing supervision to govern the process of generating and deploying tasks to the robots. The robot controller assigns tasks to single or grouped robots to execute as well as monitors and reports on their activities. The function related to scheduling and task allocation as well as comprehending the status and capacity of a robot is increasingly important when the number of automations grows. (Lowes et al 2017, 12.)

Functions

The RPA robots mimic the way in which humans perform tasks. They can log in to systems with their own user names, interpret text, tables and figures, move and click a mouse, write emails, fill application forms, and quality check and correct data in various systems simultaneously. (Hallikainen, Bekkhus & Pan 2018, 41-42.) The core capabilities and functions for RPA robots that are seen in Table 1 can be divided into data collection, data processing and other activities.

Table 1. Core capabilities and functions for RPA. (adapted from Lawson 2016, 6, Lowes et al 2017, 13)

Category	Functions
Data collection	• Opening emails and attachments • Scraping data from the web • Capturing digital data from source systems • Collecting social media statistics • Logging into web/enterprise applications • Obtaining human decisions or input via email/workflow
Data processing	• Copying and pasting data • Filling forms • Moving files and folders • Reading and writing to databases • Merging data from multiple places • Extracting structured data from documents • Extracting and reformatting data into reports or dash-boards • Generating and distributing reports • Validating or manipulating data based on if/then logic • Transferring or posting digital data to target systems
Activities	• Making calculations • Connecting to system APIs • Starting work based on a schedule or electronic trigger

In this research, the functions of RPA are divided in three categories: data collection, data processing, and activities. Data collection includes different means of capturing data, for example from emails and attachments, or scraping the data from the web or applications. The data processing category contains various functions that can be used from the collected data. The data can be copied and pasted, extracted, merged, reformatted and validated into multiple places, reports can be generated and distributed, and data can be manipulated based on conditional logic, and the data can be transferred to the target systems. Other activities are calculations and connections.

One key activity is that work can be started based on a schedule or by an electronic trigger.

2.3 Management

According to the Lhuer´s (2017) interview with professor Leslie Willcocks, there are multiple benefits of RPA. The return of investment (ROI) varies between 30 and 200 percent in the first year, reduced workload benefits employees and customer service can become better as there are more personnel to deal with customers. Success can be measured based on how many working hours are saved. (Lhuer & Willcocks 2017.) Murphy (2016) presents the benefit projections and report actuals in Figure 1.

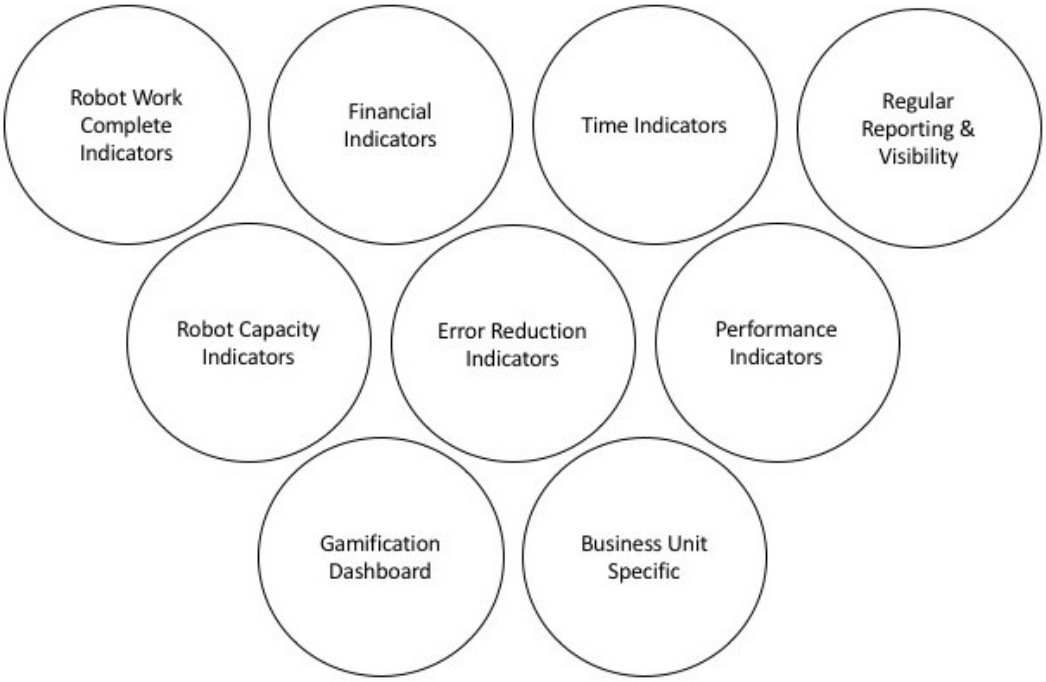

Figure 1. Benefit projections and report actuals (adapted from Murphy 2016)

From the enterprise architecture perspective, software robots enable more flexible coordination between the organization's core systems and other software, and RPA can work as a tool between IT and business (Ström 2017, 57). Singh (2018) divides benefits into four categories as seen in Table 2: cost reduction, productivity increase which includes also customer experience uplift, and employee outcome.

Table 2. Benefits from RPA. (adapted from Lawson 2016, 7; Sengupta et al 2017, 7; Lowes et al 2017, 9, Singh 2018)

Category	Benefits:
Cost reduction	• Total FTE savings and cost reduction • Removal of non-value-adding processes • Reduction in training cost • Regulatory compliance
Productivity increase ---------- Customer experience uplift	• Flexibility to scale capacity • Work around the clock • Detailed data capture • Better management information • Timeline benefits • Accuracy benefits • Quality benefits
Employee outcome	• Improved employee morale • Upskill the workforce

Cost reduction category contains savings and cost reductions in total full time equivalent (FTE), training, and process improvements. Productivity increase consists of flexibility, scalability, better data and information management. Productivity increase benefits, which functions also as customer experience uplifts, are timeline, accuracy and quality benefits. Improved employee morale and upskilled workforce are seen as benefits of employee outcome. Iyer and Tammina (2018) have developed an RPA Balanced Framework Scorecard™ that can be used to measure the success of RPA in use. In the RPA Balanced Framework Scorecard™ there are two groups of expected outcomes: financial Impact and customer impact, and two enablers: people and change management and enterprise program management as presented in Figure 2.

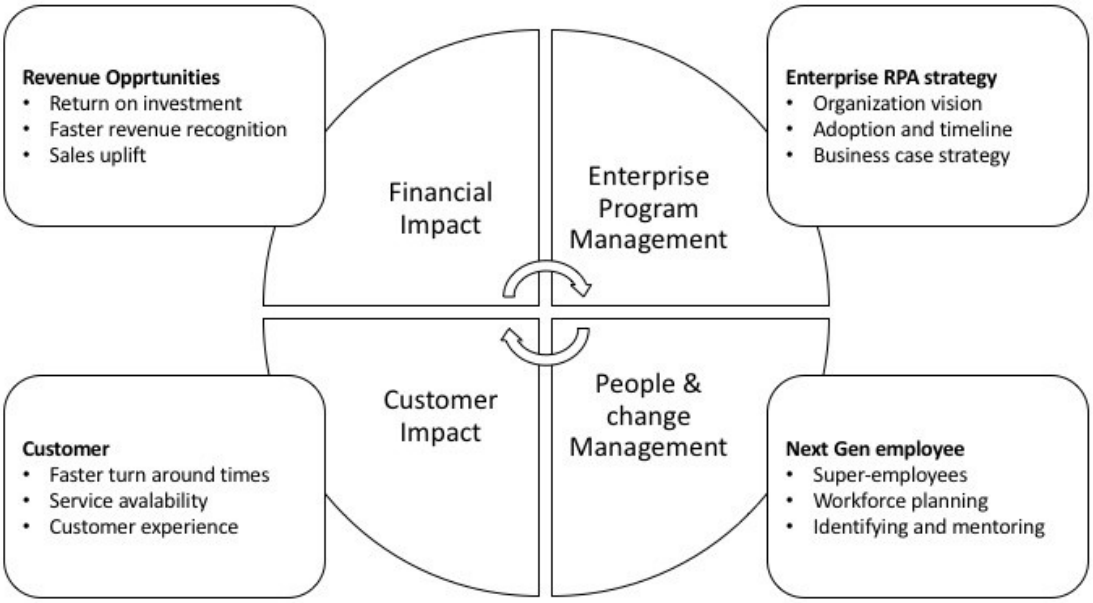

Figure 2. RPA BSC (adapted from Iyer & Tammina 2018, 2)

Financial impact assesses the financial performance of the organization using financial indicators such as increase in sales, revenue recognition, and ROI of the specific RPA object. Customer impact assessment takes into account the customers and other stakeholder whose service quality the organization wants to influence with RPA by offering more fluent customer service and faster response time. People and change management considers the performance of the RPA programs by measuring learnability, adoption of technology, culture and other capacities. Enterprise program management evaluates RPA performance from a strategic perspective where quality and efficiency are reflected to the organizations vision, and ease of adoption and timeline are analysed as a part of organizations RPA strategy. (Iyer & Tammina 2018, 2.)

PwC (2017) presents 5 categories of risks to consider with RPA that are included in Table 3: executive, technical, change management, operational and functional risks. RPA vendors present their tools to be easy to implement and use also for business people. This may apply for simple straight forward tasks, but to achieve full potential of sophisticated RPA environments, professional skills is required for implementation and ongoing adjustment. (Kirchmer 2017.) Ström (2017) states that successful automation requires some software background and programming skills, and that high-

quality automation to a more complex process cannot be created without understanding the basics of programming. (Ström 2017, 21-22, 38.)

Table 3. Risk mapping of RPA (adapted from PwC 2017; Kirchmer 2017; Ström 2017)

Type	Possible Risks	Details
Executive	• More rigid organization • Dependence of RPA • Loss of expertise • RPA program ownership	• Who owns the overall RPA initiative for the organization? • Who is developing a company-wide governance framework to promote efficiencies and reduce duplication of efforts?
Technical	• Integration • Fault-tolerance • Robot authorization • Cybersecurity	• How will control of the robot´s access to systems and data be handled? • How will robots be tested to make sure they function as intended?
Change management	• Employee resistance • Skills requirements	• Has management considered the impact the RPA program will have on human resources? • How are communications being managed?
Operational	• Quality of data • Project leading • RPA may hinder real progress	• What controls exist to monitor performance? • How will the business stay compliant with relevant regulatory requirements?
Functional	• Scalability • No development in the core systems • Human control	• Who designs controls? • Are there scalability limitations in RPA and core systems?

Ström (2017) reports that when implementing RPA environment, there came up a number of different constraints and error situations, which required modification of the access settings, server settings and operating system settings. Integration and scalability depend on the system license, technical installation and the programming architecture of the operating environment. (Ström 2017, 34-35.) Challenges also occurred in the research made by Hallikainen, Bekkhus & Pan (2018), for example, the

speed of the robot was too much for the other applications. (Hallikainen et al. 2018). The RPA automation is based on an existing technology environment and logic which induces RPA to be vulnerable to faults and changes, and that demands risk controls and monitoring. When processes change, the robot has to be modified and updated in order to ensure functioning without inaccuracy. Fault tolerance of the RPA depends on the RPA developer. (Ström 2017, 35-36, PwC 2017.)

The quality of input data is a substantial factor in order not to cause exceptions. The robots have a robust way to identify elements of applications and they are quite incapable of system changes, especially with remote environments. The robots do not apply “common sense”, which leads to that even if there is an error in the instructions that is obvious to human workforce, the robot will follow exactly the instructions given and as a result the error will be replicated until it is noticed. (Lowes 2017, 17.) Another potential risk is that there is illicit access obtained to a robot that enables altering the instructions and executing unauthorized activity. (PwC 2017). Currently RPA is a short-term solution to complete the deficiency between manual processes and automated processes in legacy systems. (Asatiani & Penttinen 2016, 68). When the organization's core IT systems are not affected, but implemented on the RPA system, there is no development in the core systems. RPA can also act as an element that locks the organization into old systems and it can be difficult to update or renew the core systems. (Ström 2017, 44, 55.)

Highly automated processes can stiffen the organization when processes are formalized into a particular mold, and hide the old processes within RPA automation. Going back to the processes and making changes can be complicated. Risks can also grow because the more work is automated, the more dependent the organization becomes of the RPA tool, and therefore the risks to the system grows. (Ström 2017, 36-37.) The use of RPA may only treat symptoms without correcting the real reasons for issues. RPA may, for example, be used for the automated reconciliation of account differences, but in the long-term it would be much more practical to correct the issues leading to those differences. Hence, RPA may impair progress. (Kirchmer 2017.) The more automated the processes is, the less there is human control. The involve-

ment in the process decreases and there can be loss of expertise. In case of a disorder in the technique, the automation does not work as it was meant to, and there needs to be considered whether there are enough skilled employees in the organization to do the work manually. (Ström 2017, 56.) Employees may consider robots as their competitors for jobs which can lead to tensions between management and employees (Asatiani & Penttinen 2016, 68).

Typical sourcing options for RPA are: direct sourcing, direct sourcing with support, and outsourcing. Direct sourcing means buying licenses directly from the vendor, direct with support means that beside the RPA license, also configuration and support include in the agreement. Outsourcing means that an organization can make a service arrangement with the service provider (Lowes et al 2017, 20). The common RPA pricing models are presented in Table 4.

Table 4. Common RPA pricing models (adapted from Lowes et al 2017, 20)

License based (most common)	**Value based**	**Service based**
Pay per software license for each installed robot, management server, and development tools Perpetual license or annual subscription The definition and capacity of a robot can vary by vendor Hardware and maintenance will add to the cost	Pricing is linked to either the FTE-equivalent savings (e.g., a fixed percentage of the FTE cost that would have been occurred), or to each completed transaction Can be restrictive to horizontal-scaling across the organization, as contracts will need re-evaluating to include additional business processes The vendor is encouraged to put “skin in the game” and maintain a good level of service	Pay for a regular subscription fee for the service, with a service agreement that defines the responsibilities of the provider This model is particularly attractive for IA solutions, which may run on complex big data technologies that can be expensive to set up and maintain in-house, or are needed on a spot basis

License based pricing is the most common pricing model. In license based pricing the fee includes all three environments of RPA: license for each installed robot, management server and development tools. The license can be perpetual or annual, and the definition and capacity of a robot can vary between vendors. Hardware and maintenance cost does not include to the license. Value based pricing is bind to each completed transaction or the FTE (full time equivalent) savings, which encourages the vendor to offer quality service. Value based pricing can be restrictive to horizontal-scaling across the organization because it demands re-evaluation of the contract when expanding automation to new processes. Service based pricing includes a contractually agreed fee for the service that is been defined in a service agreement. Kedziora & Kiviranta (2018) introduces the Aaas license and delivery model, where the investment costs are lower because the organization pays for the right to use the software, located in a cloud (Kedziora & Kiviranta 2018, 168). The total cost of RPA includes automation software licenses, implementation costs, resource requirements, technology uplift and ongoing maintenance due to core system of process change (Singh 2018).

2.4 Digital workforce

Digital workforce refers to a group of software robots that perform tasks in an organization. (Helpsystems 2017). A robot can operate the entire workflow, discharging the human workforce to operate on more demanding, high-value tasks. In other situations, it is reasonable to have humans and software robots working together. (Helpsystems 2017.) RPA can be separated to two high-level types of RPA, attended RPA and unattended RPA. Attended RPA means that the robots are launched by human workforce to complete a particular task, as in unattended RPA the robots are built to automatically operate assigned tasks without human intervention. (Arrowdigital 2018).

The two types of RPA have different features and elements but both are devised to streamline the organizations processes by facilitating scaling in variable situations. Scaling and deployment does not require workflow interruption, which denotes that the workflows can operate continuously. (Uipath 2017b.) Unattended RPA is more

extensive which gives it more plausible collaborative potential comparing to attended RPA. (Arrowdigital 2018). Attended and unattended RPA usually serve different purposes. They are deployed, administrated, and monitored differently, and are often licensed differently by RPA vendors, which makes it important to understand the differences between the two. (Ratchetsoft 2017).

Unattended RPA (also back office automation) is the type of automation that strives to require as little human intervention as practicable. Operations are launched as scheduled and transactions are running continuously on predetermined schedules, or in real time. (Arrowdigital 2018; Uipath 2017.) The robots operate under the supervision of humans, as it is necessary to monitor the execution of processes to ensure that they are successful, and that there are no cases that have not been accounted for. When an exception or a problem occurs, a human expert (a robot supervisor) must determine the cause, correct it, and then restart the robots so that the process resumes where it had stopped. (Untrite 2017.) Unattended RPA is frequently used for back-office functions which have a boarder impact on the organizations workflows, and it handles the administrative processes overview. Back-office functions can help streamlining internal organization workflows that influence the more granular aspects of workflows. Large amounts of data can be collected, sorted, analyzed, and distributed via unattended RPA. This enables more organized processes on the front-end of those workflows. (Arrowdigital 2018; Uipath 2017.)

Unattended RPA can be accessed and controlled remotely via interfaces or platforms, and the operations can be monitored, analyzed and modified continually. Schedules can be deployed by the administrator as well as auditing and reporting. (Uipath 2017.) Occurring exceptions demand administrator´s attention and sometimes also support from the organization´s IT department. IT department can also participate to the configuration of the unattended robots as the robots operate transferring data between legacy systems and other software, internal systems and external solutions. Unattended RPA can help organizations to develop their processes and introduce new technologies that can otherwise be considered too costly, complex, or disruptive to implement. (Arrowdigital 2018.)

Unattended RPA has notable ROI potential. Arrowdigital (2018) presents that according to McKinsey & Company, *"Organizations that leverage RPA may see anywhere between 20 percent and 200 percent ROI".* Organizations with higher RPA maturity can utilize unattended robots to enable better digital transformation, and the organizations that pursue innovations and workflow transformations through RPA have high revenue potential from unattended RPA. Unattended RPA should be contemplated as a long-term business investment as it is generally comprehensive and strategic investment that will have long-term business outcome. (Arrowdigital 2018.)

Attended RPA (also desktop automation or front office automation) relies more on co-operation with an organization's employees and human intervention is required. Attended RPA is sometimes referred to as desktop automation because attended RPA solutions can be located at an employee's workstation. Attended RPA uses the same front-office programs as human employees, and it is triggered by specific events, actions or commands that an employee apply within a specific workflow. A user can launch a robot to operate by command buttons on an RPA tool, using an on-screen button that has been programmed inside an existing interface, or the robot can be integrated to a workflow activity without observable impact on user interface. (Uipath 2017; Arrowdigital 2018.) Attended RPA can be placed on a specific workstation, but then access and automation features are bound to the person working on that workflow at that particular workstation. (Uipath 2017.)

Attended RPA is generally used to fix specific problems encountered by employees, whilst the human workforce operates as coordinators of the workflows (Arrowdigital 2018). The robot can be devised to return control to human workforce, so that a person can make a decision that requires judgement or business experience (Untrite 2017). Attended RPA streamlines workflows, and enhances, rather than replace or repair, workflows using software robots. Tasks that include copying and pasting data or sorting spreadsheets can be automated with attended automation, and launched on command or as a response to specific workflow transaction. Attended RPA is a leaner and tactical type of automation that provides a non-disruptive element to ex-

isting processes. Attended RPA has advantages because it lets users quickly coordinate simple but tedious tasks, and it generally brings forth more immediate ROI. (Arrowdigital 2018.)

Running either attended or unattended automation from an integrated platform will require centralized management. Centralized management has not been an option with the first-generation attended robotic platforms, but with the progress of browser-based server applications has led to that both attended and unattended robots can be centrally launched, reset, supervised, examined, scheduled, queued or updated. A server will be able to trigger a robot and manage assets, workflow queues and versioning. Execution logs and process uploads are gathered to the server. Even though there are similarities according to the centralized management, it is still important to know how each type of robot is operated because they effect on licensing and the deployment strategy. (Liebross 2018.)

RPA is a new issue and its introduction may be accompanied by suspicion and resistance to change. Considering information technology innovations, there is also concern about the survival of jobs. Pajarinen and Rouvinen (2014) present that one third of jobs in Finland are likely to disappear with automation, especially in the short term, before the development creates new jobs (Pajarinen & Rouvinen, 2014). Davenport and Kirby (2015) on the other hand demonstrate that automation supports and edits people's roles in tasks that are not being effectively performed by digital workforce (Davenport & Kirby 2015, 58-60). With augmentation, an organization can evaluate what is the work humans are currently doing and pursue to increase rather than decrease that work by an active use of automation. With the help of RPA, human workforce can take on tasks that are more sophisticated, fulfilling, and better suited to the talents of individuals than before. The tasks that are more suited to human workforce will be different from the tasks that computers are able to perform well. Augmentation demands that employers understand and entrust that that the combination and cooperation of human workforce and RPA is more influential than operating separately. (Davenport & Kirby 2015.)

Singh (2018) presents examples of new roles that can emerge with the use of RPA. These roles are listed in Table 5. Robot controller is the manager who takes care of scheduling the robots and monitors the processing, and will take care of the retraining of robots as legislation or systems change. Robot controller also ensures that new people learn to work with a robot. (Singh 2018; Fischer 2017.) Business users are the employees that handles with the exceptions generated by the robots (Singh 2018). Technical application manager installs and maintains the software, system and security settings, and monitors the running applications with the help of the vendor support (Singh 2018). RPA requires either an outside or an internal entity to develop and maintain automations. Particularly changing environment requires continuous maintenance and monitoring. (Ström 2017, 21-22, 38.) The goal should be to enable the training of robots to the organization's own workforce to ensure that the organization is able to develop processes with better knowledge, train congruous robots, and have capable personnel, who is able to influence the development of their own work. (Fischer 2017.)

Table 5. New Roles. (adapted from Singh 2018)

New Roles	Tasks
Robot controller	• Manager of the robots and primary point of contact • Takes care of scheduling of the robots, monitors processing and signals potential issues
Business user	• Employees that handle the exceptions generated by the robot
Process robotics developer and maintenance	• Develops objects and processes within the process robotics application • Maintains modelled processes in case of changes within applications • Is first point of contact for robot controller in case of issues
Technical application manager	• Installs and maintains process robotics software (server/virtual desktops infrastructure/local) • Maintains the system and security settings • Monitors if applications are running
Vendor support	• Support in technical maintenance of the process robotics software and high priority issues

Processes

A process of a task needs to be passed in review before it can be evaluated from the perspective of RPA. The analysed and improved process is reviewed with experts participating in the initial definition. The process can be further improved on this basis. The final version works as standard for the RPA. (Luukka 2016.) The process is assessed by calculated benefits, descriptions of qualitative benefits, and risk analysis to assess project profitability (Haikonen 2016). By accurately assessing the processes, there can be identified the areas in the organization where plenty of effort is misspend in repetitive tasks. These tasks can be partly or fully automated via RPA. (Kerremans 2018.) If proper tasks are found, automation can be started (Luukka 2016). There are some requirements for the process to be suitable for RPA. In Table 6 there are collected points to consider when resolving process suitability for RPA. Process considered for RPA should be voluminous in workload, performed frequently, or include high volume sub-tasks. High volume transactions demand high percentage of staff sometimes also additional staff, and they take a large percentage of employee´s time as the function is often repeated. An appropriate candidate for RPA involves accessing multiple systems, and the task has to be executed within predefined set of IT systems that remain the same every time the task is performed. Data needs to exist in the IT systems with minimal or no manual intervention. (Asatiani & Penttinen 2016, 69; Fung 2014, 2; Haliva 2015, Seasongood 2017.)

RPA tools can process standardized, structured digitized data (Singh 2018). Process needs to be easy to break down into simple straightforward, rule-based steps that are highly standardized and only little or no exceptions occur while completing a task. The process cannot require creativity, subjective judgment, or complex interpretation skills, but it can be prone to human specific errors, and include critical functions as the cost of automation can be lower than the cost of business impact errors. Organization needs to understand current cost structure of the process and to be able to estimate difference in cost, calculate return on investment (ROI) of RPA, and estimate the delivery time to develop the automation service. (Asatiani & Penttinen 2016, 69; Fung 2014, 2; Haliva 2015, Seasongood 2017.)

Table 6. Criteria for RPA (adapted from Asatiani & Penttinen 2016, 69; Fung 2014, 2; Haliva 2015, Seasongood 2017)

Asatiani & Penttinen; Fung	Haliva	Seasongood
High volume of transactions	Which processes take up a large percentage of employee´s time? How many steps are involved in the process (both user and integration steps)? Which process require a high percentage of dedicated staff? Which processes require hiring of additional staff during seasonal spikes in workload?	Has the function been repeated over multiple periods? How many hours does the process consume on an annual basis? How much of that time could be spent on activities that would produce a greater benefit?
Need to access multiple systems	How many different applications does the process use end-to-end?	Is data coordination limited to one or two information technology systems?
Stable environment	How often does the process is changed? How much does it change? What is the lead time for change?	
Low cognitive requirements	Are there decision-points within the process that require human intervention?	Do the process descriptions or activities include logical elements that can´t be programmed into software solution?
Easy decomposition into unambiguous rules		Do data elements supporting the processes exist in IT systems with minimal or no manual intervention?

Proneness to human error	Which processes have the highest percentage of human error? Does it include critical functions?	
Limited need for exception handling		
Clear understanding of the current manual costs		
	What is the estimated delivery time to develop the automation service?	Do management and other leaders have experience with the program and a strong knowledge of its execution and results?

RPA technologies have developed substantially from the early techniques of screen scarping and the development continues. The collaboration between RPA and AI will allow complex capabilities to emerge. (Ostdick 2016.) Currently software robots are able to operate simple processes as combination of RPA and artificial intelligence, which imply that the days of cognitive automation are on the horizon. Cognitive automation will be able to improve performance by making complex decisions with low human involvement or programming (Ostdick 2016). Arrowdigital (2018) predicts that in the near future, organizations will deploy more widely the combination of unattended and attended RPA, machine learning and cognitive automation components to pursue Intelligent Process Automation (IPA). While RPA's goal is to automate manual work, IPA seeks to do this by creating smarter digital workflows and giving human workforce more demanding and challenging tasks in the workplace. (Arrowdigital 2018.) IPA differs from RPA in that it goes beyond recording a particular business process and repeating it, to harness AI to learn how to adjust and improve the process flow, creating intelligent processes (Berrutti, Nixon, Taglioni & Whiteman 2017).

3 Research Method

Some tasks are more efficient when done by robots, but sometimes the robots can be in a more assistant role. There are many tasks that require human decision making, which means that they cannot be automated. The aim of the study was to examine which factors influence the choice of the right type of an RPA solution and the combination of humans and robots in finance and accounting tasks, to attain an effective hybrid workforce. As a result, this research presents a tool for the evaluation of tasks when considering automation with RPA. The main research questions were:

What makes a task opportune for RPA?

And:

What factors influence the choice of the suitable type of RPA solution?

This research focused on finding the factors influencing how to use digital workforce on tasks in finance and accounting processes. The research was based on the studies of RPA, process automation, and process identification. Processes were evaluated on the task level, and the purpose of this research was to discover the optimal combination for a hybrid workforce. The data of the theory and interviews were examined in such a way that they formed a model for assessing the suitability of the tasks for RPA. The research was limited by excluding the implementation of RPA, change management, and comparison and selection of suppliers, because it would have made the research too board. Artificial intelligence was also limited from this research as AI and RPA together are just in the early stages of development.

The chosen methodology for this study was qualitative. Taylor, Bogdan and DeVault describe qualitative research as inductive. Qualitative researchers develop concepts, insights, and understandings from patterns in the data. (Taylor et al 2016.) In this research, the focus was on exploring concepts and insights and on understanding the patterns considering the process of choosing an RPA solution, and choosing the tasks

for automation. In addition to the qualitative definition, this research can also be defined as applied research and evaluation research. Merriam and Tisdell state that applied research is undertaken to improve the quality of practice, and that the main purpose in evaluation research is to establish a basis for decision making by collecting data on the value of a program, process, or technique. (Merriam& Tisdell 2016, 3-4.)

This research is a mixture of a basic qualitative study, qualitative case study, and grounded theory as seen in Figure 3. The research is mostly a basic qualitative study because it focuses on understanding the process of choosing the right kind of automation for the right tasks. However, it still has pieces of a qualitative case study, where the process of choosing tasks for RPA, and choosing the type of RPA can be seen as the cases. There are also some features from the grounded theory.

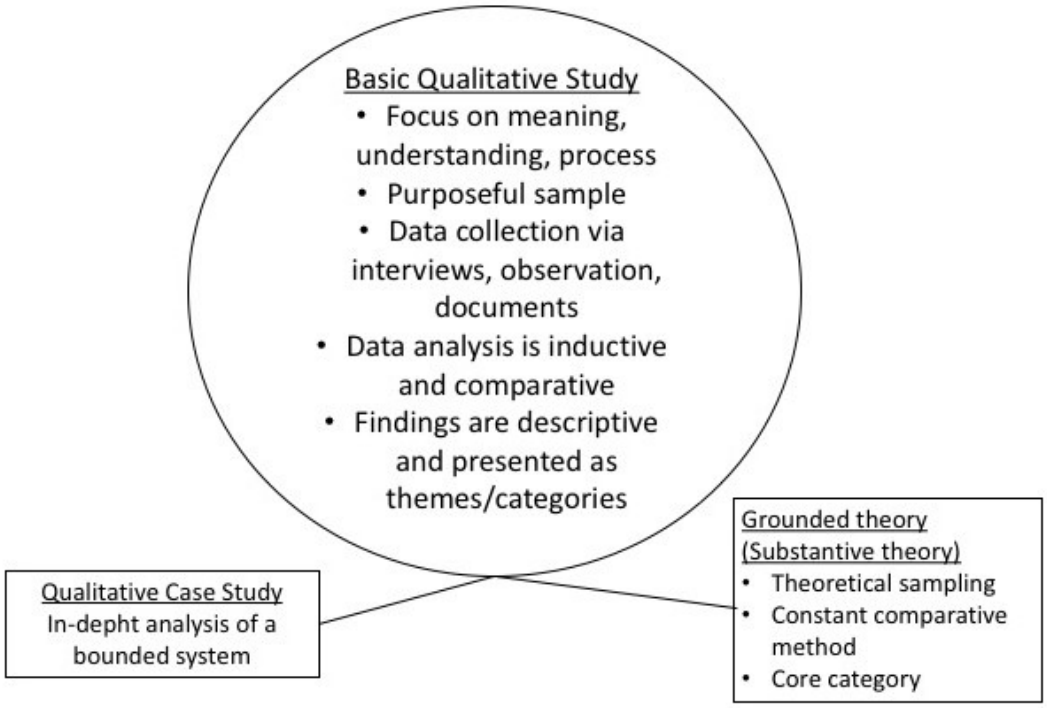

Figure 3. Types of qualitative research (adapted from Merriam & Tisdell 2016, 42)

Taylor et al. describe the grounded theory approach as a method for discovering theories, concepts, and propositions directly from data, rather than from other research or existing theoretical frameworks. The aim is not to seek proof for the theories but

to demonstrate plausible support for the theories. (Taylor et al. 2016.) In this research, there was a limited number of prior studies or theoretical frameworks to base research on because the subject was new, and it had not yet been researched widely from the finance and accounting points of view. This meant that the concepts and propositions had to be combined based on both literature and the collected research data.

The research data was mostly collected from interviews, because the RPA experts have professional insights about the research problem. The information collected from the interviews could not have been obtained from the literature because of the limited amount of academic research in this subject. Taylor and colleagues (2016) refer to qualitative interviews as nondirective, unstructured, non-standardized, and open-ended interviewing. The interview resembles a conversation rather than a formal question-answer exchange, and the role of the interviewer comprises learning what questions to ask, and how to ask them. (Taylor et. al 2016.) The interviews included a document analysis where the documents were provided by the interviewees. The four documents, later referred to as research documents, were from three organizations and they included detailed information about and practices of how organizations choose tasks to be automated. The research documents were only used for comparison, and they were explored to discover patterns between different organizations. According to Bowen (2009), documents differ from interview data because documents contain text and images that have been recorded without a researcher's intervention, and often documents provide supplementary research data. In a document analysis, the data are examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge. (Bowen 2009.)

The interviews were conducted as semi-structured interviews. A semi-structured interview means that questions are flexibly formulated, or that the interview can be a mix of both strictly structured questions and more freely formulated questions. (Merriam & Tisdell 2016, 110-111.) In this research, the author had the same basic questions for all interviewees, but the conversations lead to different orientations, depending on the experiences and areas of expertise of the interviewees. This was to ensure the extent of the data considering the research questions. The interviewees

worked in expert roles in the field of RPA and represented four different organizations. All of the interviewees had strong expertise in using RPA in finance and accounting tasks as well as have insights about the process of choosing the tasks for automation and choosing the type of RPA. Taylor and colleagues (2016) present that when an interview is directed toward learning about events and activities that cannot be observed directly, the people being interviewed are informants. The role of informants is not simply to reveal their own views, but to describe what happened and how others viewed it. (Taylor et. al 2016.) The sample was chosen for its relevance to the research problem. The data led to the next document to be read and the next person to be interviewed. Reaching a point of saturation means that the responses to the interview questions, and the behaviors in observations, are becoming the same and no new insights are forthcoming. (Merriam & Tisdell 2016, 99-101.) The sample in this research consisted of eight interviewees from four organizations and research documents from three organizations. The interviewees were chosen from organizations that are using RPA currently, and the organizations recommended who to interview. The interviewees represented different roles in RPA teams, from coders to managers, and human resource experts. In this study, the interviewees are referred as P1, P2 etc. to P8.

The interviews were conducted between 17 September 2018 and 11 March 2019. Two of the interviews were conducted face-to-face and six were online interviews via Skype for Business. The reason for the online interviews was the distance between the author and the interviewees, because the interviewees worked in different parts of Finland. The interviews were conducted in Finnish, and the author has translated them into English. One hour was reserved for the interviews, and their duration ranged from 53 to 57 minutes. All of the interviews were transcribed by the author. Three of the interviewees asked for questions or themes beforehand. The conversations were carried out with the same themes in all interviews. The themes are presented in Table 7.

Table 7. Interview themes with details

Theme	Details
Basic questions	Job description and experience of RPA The use of RPA in the organization
Human roles	RPA-Teams Human workforce Future
Choosing tasks for automation	The process from start to finish Duration Meters
Choosing the type of RPA	Experiences Insights Future
Risk management	Cyber security Ensuring skills and competences Technical risks
Future	Insights

The interviews consisted of six themes that were selected on the basis of the theory. The basic questions dealt with the kind of work experience they had with RPA, and how RPA was used in their organizations. Human roles were discussed from the perspective of the developers and from the user point of view. The questions on human roles were based on the theories presented in Table 5 in Chapter 2.4. The main themes that created the data for the task evaluation tool were: choosing tasks for automation and choosing the type of RPA. The interviewees were asked to describe in details how the process of choosing the tasks for automation was done in their organizations, how long it took, and what kind of parameters were used to ensure that the process was profitable. The interviewees shared their experiences and insights about choosing the type of RPA, and how it had evolved during their RPA careers. The assistive questions were formed with the information learned in Chapter 2.4 that presented the theories of a digital workforce. Risk management was discussed because of its many different effects on business fluency, profitability, and operational

reliability. The questions on risk management were based on the theories presented in Table 3. Finally, the interviewees were asked how they saw the future of RPA and automation in general.

"Content analysis is the process of organizing information into categories related to the central questions of the research" (Bowen 2009). In qualitative research, the collection and analysis of information should take place simultaneously. By continuous analysis, the researcher remains aware that the information is meaningful and structured. (Merriam & Tisdell 2016, 196-197.) In this research, the data were analyzed thematically, and by using components from the constant comparative method of data analysis. Merriam and Tisdell (2016) present that the constant comparative is a method that involves comparing one segment of data with another to determinate similarities and differences. The overall object of the analysis is to identify patterns in the data. These patterns are arranged in relationships to each other in the building of a theory. (Merriam & Tisdell 2016, 32.) The analysis plan was loosely based on the data analysis example presented in Figure 4 below.

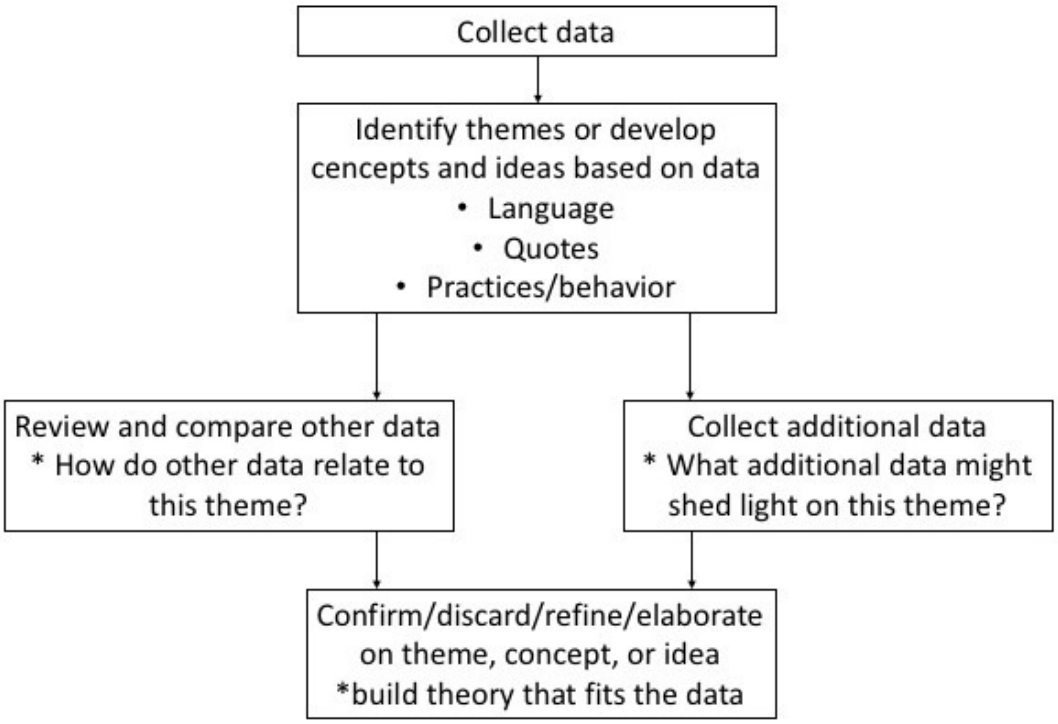

Figure 4. Data analysis (adapted from Taylor et. al 2016)

In this research, the above figure was interpreted so that the data in the beginning was the data obtained from the interviews and that additional data that was compared to the interview data came from the research documents. The data from the interviews were transcribed and structured in themes and codes. The analytic procedure entails finding, selecting, appraising, and synthesizing data (Taylor et. al 2016). Taylor and colleagues (2016) describe the practice for the open coding analysis:

1. Read and reread the data, noting possible themes.
2. Consider various ways of labeling and organizing bits of data.
3. Make preliminary decisions about lines of analysis to pursue.

(Taylor et al 2016.)

Information and insights from the research documents are valuable additions to a knowledge base. Document analysis includes skimming, reading, and interpretation. This process combines elements of content analysis and thematic analysis. Document analysis is a complementary data collection procedure in support of triangulation and theory building. (Bowen 2009.) The final step of the analysis as presented in Figure 4 was to refine or elaborate the themes and build the conclusions based on the data. The procedures and the examples that described in this research came from the actual cases presented by the representatives of the organizations. The data collected from the interviews and the research documents was pieced together, and forms and models that recurred in the research data were assembled into one entity.

4 Hybrid Workforce in Case Organizations

The purpose of this chapter is to elaborate on the types of tasks with potential for unattended, attended and human workforce, based on the lessons learned from the studied documents and interviews. Hybrid workforce is a combination of human workforce, unattended RPA, and attended RPA. The terms attended RPA and unattended RPA are not commonly used in everyday working life, but they are still superseded by the old terms of front office automation and back office automation. In this chapter, a task expert is a role of a human worker that has the substance knowledge about the task. Developer is an expert role of RPA, as the developer does the actual code for the robot. The task expert and the developer can be the same person, or

two or more different persons. From both roles can also be formed a team of excellence, depending on the organization, the task, and tasks complexity. Advisors are the persons between task experts and developers. Advisors help the task experts to collect required information at an appropriate level for the RPA evaluation and they usually participate in the evaluation.

4.1 Unattended RPA

Among the interviewed persons´ organizations the ideas of which tasks should be automated comes from the employees doing the manual work, as they are the experts in their own work. Companies can also use RPA-workshops to introduce the basic features of RPA to employees, which will make it easier for them to suggest tasks for RPA. At first there has to be a description of the current state of the task, and the desirable outcome. The ideas can be passed in review by an advisors or advisor team to ensure that the task is one that can be automated in general. Before the idea can move on to the process it needs to be defined carefully. Organizations have their own routines for the defining process, and it usually includes a formal document, form that is used to estimate the potential a task has to be automated with RPA. Forms are filled by the experts, advisors, and sometimes also developers, and other required specialists. The forms are tailored to the needs of each organization, but the critical factors for the processes are similar:

- The data that is used in a task needs to be structured, and digital (or to be digitized)
- Rules for processing data needs to be simple and unequivocal

The forms can be used in many different ways, some organizations use them for the early stage evaluation as others use them through the whole process, including technical evaluation. The evaluation defines if the task can be automated, automated with RPA, and whether it is reasonable to automate.

The most commonly used unit of measure is time: how many man-years automation could and should save. Organizations that are in their early stages of automation journey can accept a little smaller saving estimates, as more experienced organizations have stricter criteria. The time that is spent on the evaluation of a task varies in

different organizations, due to practices and governance. Some organizations have a so called fast evaluation, where a team of advisors check through the idea and give propositions whether the task is suitable for RPA, or other type of automation. Other organizations evaluate tasks very detailed and includes technical evaluation from the beginning. In one example the expected duration from the presented idea to a decision whether it is going to be automated or not was one month. After that, the time schedule varies very much because the scripts differ to a great extent in sizes, challenges and anomalies.

Eminently in the beginning of the automation journey the focus for automation is to intensify efficiency. The continuation is to be influential, which means that with robotics an organization has a larger information base to use, and there can be done new tasks that have not been able to conduct earlier. With robots, there can be verifications, or new statistics done that ensure the quality of work. After the task has been approved on critical factors, it can be evaluated from the angle of development effort, and benefits, as seen in Table 8. The task is more likely to be automated if it has high potential, low effort, and automation brings out benefits which cannot be achieved otherwise.

Table 8. The demands for the tasks based on the research

	High Potential	Low effort	Benefits
Data	Digital Structured		
Inputs	Standard formats	2-3 apps, 3-5 screens, 10-15 fields	
Rules	Rule based, no cognitive decision making	Simple rules, all data within screens	
Exceptions	Low number of exceptions	Few exceptions, simple actions for exceptions	
Transactions / time spend	High volume and/or a long time spend		

Data entry	Duplicated data entry		
Systems	multiple		
Virtual Environments		No virtual environments	
Third party applet used via browser	Low number of external applets		
Changes in systems	Stable systems	Low change	
Changes in process	Stable process	Low change	
The task is currently outsourced	Easy to measure the savings		Internalization of the work
Detailed work instructions		Shorter time for process definition	
New services			Improved quality, New way of earning
Customer experience			Customer satisfaction
Resources	Demands human resources		Human resources can be used in other tasks.
seasonality	Seasonal variation		
Error sensitivity	High risk for errors in manual work		
Costs of errors in manual work	High cost of errors in manual work		

A task has high potential for automation if the data is digital and structured, the rules for processing the data are simple, and does not demand cognitive decision making, and have only few exceptions. The potential rises if there are high number of transactions that demand a great deal of time, manual work and human resources, in a stable process that uses stable systems. Seasonal variation suits RPA because of the easy scalability of robots. The tasks can have high risk for errors, and costs of errors

because the robot does not make negligence errors. Systems can be multiple, but the share of external applets, like third party web-pages, should be low. External applets bring out the risk of uncontrolled changes when the web-pages change unexpectedly. The effort of development is low when the task has simple, defined rules that have sparse exceptions, and changes in systems and process are low. There can be approximately 2-3 applications that use 3-5 screens, and 10-15 fields, but the virtual environments like Citrix is not recommendable. Automation with RPA can bring out benefits when improving the quality of work, and customer satisfaction. At the same time, human resources can be used in alternative and more demanding tasks. In some case the outsourced work can be brought back into the organization because it can be a more economical option, if a robot performs the same work.

Streamlining the processes is a step that is needed before the development of automation can begin. When the idea for automation arises, it should be considered as a problem statement, how to fix it. Sometimes the answer can be changing the process, or doing the changes in the system used. When streamlining the process for automation, there should be involved a person who is an expert on that process, but also a person who understands what is possible to perform with RPA. This will ensure that the process is changed in a way that ensures the use of RPA in a best practice, instead of just making the robot carry out exactly as humans do.

> *"If you think that the problem is solved by taking this certain medicine, the better solution for the long run could be just to wear a scarf so you will not become sick."* P5

> *"It is not rational that the robot makes all the mouse clicks exactly like humans would do."* P1

If the original process description is after all used for automation design, the document needs to be cross-checked that it is up to date, and describes the manual process as detailed as is needed for automation.

The demand for workers varies depending whether the development is done by the organizations current employees, new recruited employees, or if the development is outsourced. If the development is outsourced, the demands for workers are limited. When the employees have basic understanding of RPA, they can pursue potential ideas for tasks to be automated with RPA, and they can easily handle with the outcomes. The developing platforms of RPA usually operate with graphical interface, and have recording wizards to help developing the script. A common opinion is that developing scripts with these RPA tools does not require programming experience, but some programming knowledge does help to understand the logic, and to handle with the exceptions. Besides programming knowledge, it is important that the developer understands the process, and organizations can assemble their RPA team among the process experts that inform their interest for RPA.

Information security is an important aspect to think about when operating with RPA. Some systems have capacity to save everything in a database, and encrypted. Data communication can also be encrypted, which means that no information is left on desktops. The robot can also be disconnected from the Internet when it is not working. Operation risks can be prepared by creating individual logins for every automation with minimal permissions to systems, so no automation has extensive rights to the systems used. Login can be named so that it stands out from the log information. The more the organization has different software programs in use, the more difficult it is to administer the programs in general, and from the automation point of view. If there are many programs involved in automation there is a risk of the script failure for each program, because of the updates, and changes that will occur from the updates. For example, MS Office updates have resulted in script execution failures and the updates are hard to brace oneself for, because the updates are not announced precisely in advance. The risk of use means that there has to be thought out what it signifies if automation fails. For example, how long can the error take so that it does not affect the work too much, how critical is each automation, and are there sufficiently skilled human workforce to perform the job manually.

> *"The process owner has already saved at least 7 man-years and transferred those people to other tasks, so if I would have to tell her that we don´t have that robot anymore, it would create troubles."* P7

Theoretically, the robot has three man-days to use every day but for the most part it is not actually in use all the time. When contemplating the time schedule for the robot, it has to be considered what kind of data transmissions there are for the systems used, and what is the impact of the robot for the people working at office hours.

The purpose of automation is mostly to generate savings. Savings are usually measured by man-years, money or both. For example, the man-year saving figure is calculated by the information about how many times the task is done in a year, and how much time does it take from a human to complete the task. The average minimum objective varies between 0.5–1. If the saving is considered under 0.5 man years, the payback time increases uneconomically. When evaluating the savings, it is important to measure the right objects. Generally, tasks include exceptions which means that the robot is not able to perform such task, but it is left to the human worker. Only the tasks that robots can perform are measured in time, not the exceptions that demand more time and effort, because that work is excluded from automation. If the task has great risks when done manually, and the risks can be valuated, even a task with low savings in man-years can be economically reasonable to automate because of the financial impact value of the risk. Companies in their early stages of automation can settle for a minor target as the companies with more experience and knowledge can have more prominent goals.

> *"Building the script can easily be over 10 000€ per script, can be more or less depending on the task."* P5

Beside the ground work and coding there are more expenses in automation process. There are expenses with maintenance, updates, and license fees. One important aspect to consider about is the cost that comes from preparing the exceptions. If automation is running critical tasks, there have to be a backup plan of how the situation is

going to be dealt if automation fails. Considering a critical task, there have to be capacity to perform the job manually if automation does not function in a planned time frame. When there is system updates or changes coming to the systems in the near future, it might be unprofitable to automate tasks involved, because automation needs to pay back its costs before the system is replaced. On the other hand, because the payback time is quite short with RPA, a task can be considered for automation if the savings are significant, and automation covers the costs before the new system is introduced. Sometimes RPA can give more time to vilify with the old systems, and postpone the need for investment.

4.2 Attended RPA

Attended RPA is a more simple and lightweight type of RPA. A user that is familiar with automation and RPA can use attended RPA as an assistant, and code it to perform the tasks that suits RPA. The task does not necessarily need to be as repetitious as the task that apply for unattended RPA. Front office robots can perform simple tasks that help the users work, and that is why it can be easily accepted among employees.

> *"A front office robot is a little like servant and you tell it what it needs to do. It requires that the user triggers it on."* P4

The world is digitized, and the need for real time information increases. The work that was earlier done at the turn of the month, can be done during the month with the help of automation and robots. This will give more real time information for business to use. Attended RPA script can be more simple than unattended RPA script. Unattended RPA needs to have logins and log outs to the systems included, but in attended RPA the user can run the logins before automation is started, and automation can begin directly from the subject matter. One way to use attended RPA is to make prototypes of larger automations. The idea for an automation can be tested with attended RPA, and whether it indicates to be effectual, there already exists explicit specification for the use of unattended RPA. That is a type of fast track development.

When automation is already tested, and the specs are implicit, the external acquisition cost can be more moderate. The idea for attended RPA can come from the user or within a conversation with colleagues. The formal development process does not necessarily apply with attended RPA, and the responsibility is more with the user, as the user is also the developer.

> *"Usually I have thought the matter over and created automation, and afterwards I present the ensemble that a certain task could now be done this way with automation."* P8

If there is capability in the organization to make attended RPAs, it can be done for more than one worker. The task can be such that it demands multi-man effort, but with attended RPA, it only demands one worker that runs automation, and ensure that it works correctly.

> *"This automation is not actually my own task, but it has influenced about twenty people that have done it in some level, but now I do it centralized with this automation."* P8

Here is an example of attended RPA in finance process that operates credit-loss provisions for receivables. The robot receives a SAP report where receivables and age distributions are listed, and extracts that data to Excel as raw data. These files are copied to another excel, which includes documented calculation template. The robot prepares this excel to a csv-file that is imported to SAP. The robot also collects all the data together and a dash board report is made. The provisions go to balance sheet, and to the income statement, which means that if the provision changes it will have a significant impact on the organization´s result. With the help of the robot the credit-loss provisions can be monitored, and they become more visible than before. Since the data is much more accessible, process experts can found new angles and observations, which is a by-product of this automation. The robot is run couple of times during the closing, and after the closing. Manually done, the work demands labor inputs from several process experts. Attended RPA is chosen for this task because the task is done only a few times a month, not regularly repeated.

It is an advantage if the person making automation has understanding about coding, but it is not necessary to have previous coding experience. In the process from idea to automation, time is spent to create a clear vision of what needs to be done, what is the wanted outcome, and how would it be wise to implement. When the developer is the user in attended RPA, it helps that the underline process is familiar. Coding can be done for example with help of a wizard recorder. How much the coding takes time depends on the developer, how experienced one is with the work and the RPA software tool.

> *"If you have a clear idea of what needs to be done, it takes a workday or two to spec a simple automation."* P8

The exception handling can be a more complex operation. If there has been changes to the systems used that will make automation fail, it takes time and understanding to remedy the cracked part. For example, if the Office package updates, and there is a new version of Excel in use, it will break automation. Some of these exceptions can be envisaged when coding the script. If the front office robot is run from the desktop there can be unexpected occurrences, if for example a chat window pops up. That can be taken into consideration in advance, and code an exception handling that automation ignores that chat pop-up, into the script. The risks of attended RPA are somewhat the same as in unattended RPA, but in a smaller scale. For example, the operation risks with the systems and their updates are the same, but as automation is developed by the user, he can directly monitor automation on stream. If the user is also the developer it is easier to detect errors, challenges, and needs for updating.

The tasks automated with attended RPA are usually of smaller size, which means that if automation fails the quota of manual work is also smaller. In attended RPA it is not necessary to give the robot the login information, because the user can first log in to the systems, and then start automation. Automation can be run from the user´s desktop or from a cloud server. If the robot is run from the user´s desktop it occupies that computer for that time. A robot is nonetheless faster than humans, and the constraints are the systems response time, and the possible latency of the network connection. The risk of tacit knowledge is the dependence the organization has for the

skilled employee that can develop, run, and update the attended RPA. Automation succeeds is measured in time. The time spend when the work was done manually is compared with the time it takes for the robot to perform the same work. The indicator can be arguable, because it does not take into consideration the time that is spend for updating automation. If the developing is given to an external developer, the costs can be higher than the benefits.

Not all of the RPA software platforms support attended RPA, but attended RPA can also be developed and run on test automation tools, or open source software. That is why the license costs cannot be directly calculated for all cases. In a RPA software platform that supports attended RPA, the license fee is approximately 25% of the unattended RPA license fee.

> *"If the license for a back-office robot is 6000, for a front office robot it is 1500."* P4

In addition to the license, there will be cost from the development. If the organization has skills to make automation in house, the developing cost consist of the time spend to develop and code automation, and the time spend updating automation. External cost can therefore be zilch. Rare organization can exploit automation so that automation would work 24/7. The robot has certain capacity, and there can be various automation scripted for one robot that can be scheduled at different times, but usually it does not still work 24/7. Attended RPA can also be chained to multiple scripts that are run separately.

4.3 Human workforce

Human workforce still plays a major role in the companies that have implemented RPA in finance and accounting tasks. After applying RPA manual work has decreased, and some tasks have ended, but jobs have not been lost. The goal is to generate cost savings by releasing skilled employees to expert tasks, while RPA is doing routine tasks. The feedback from employees has been divided, as some employees welcome

robots with open arms to take the edge of from the pressure and rush times, while others still have doubts.

> *"Some feel that their professional pride suffers when a robot can do the same affairs faster, with higher quality and more effectively."* P3

In the beginning employees may have prejudices whether the robot is able to perform properly. When doing the specifications for automation, it can feel that the amount of work is increasing instead of decreasing, because the specification demands process development. Job descriptions are changing. One automated task usually raise approximately 10-20 % controlled exceptions. These exceptions bring out new roles and tasks to employees.

> *"Before there was lists with 300 rows that needed to be manually checked, now a robot does the checking in the night and only the intractable checkups are left to human workforce."* P3

Companies have previously outsourced manual work because it is more cost-effective in countries with lower labor costs. Development will also require automation skills from these partners, and on the other hand, some work can be brought back due to automation. Collaboration between developers and task experts is essential when doing the specifications for RPA. The competence in the subject matter is with professionals, and developers have the competence in coding. Task experts need to express how the task is done, and to raise up possible exceptions. The role of an advisor is a new role that demands knowledge of RPA, and understanding about the substance. Solution-oriented approach is needed with human workforce. The cost structure can be hard to understand, as a task might not be economically reasonable to automate although employees feel it should be automated.

> *"Now we have some overlapping, because we have the expert that knows the substance and the process and we have another person who can develop automation. Such multidisciplinary experts that can do both*

> *are needed in the future. Whether it is easier for a finance and accounting expert to learn how to develop robots or a developer to learn finance and accounting competence, I don´t know."* P5

Some companies have already started using their employees as developers. The people in the developer-team does not have to have previous experience in coding, but the team is assembled from people that are experts in finance and accounting department. The team needs to share interest and motivation to learn how to code robots along with they own work. In an example organization, the team was built when starting the automation journey. The training for the technology took three half-day sessions and a final exam. Thereafter the team started to train themselves, and learn and study more with the help of online courses. At first the developers worked part time with robots, and part time with their substances, but after the RPA has proceeded and grown, most of the team members now work as full time developers. New team members and trainees have had more experience in programming, and strengthen the team. The team has sparring sessions twice a week, and they help each other with occurring problems. An outside consultant helps the team with the more difficult challenges.

5 Results

In the beginning of this thesis, it was stated that as a result, this research would give a tool for the evaluation of tasks when considering automation with RPA to help the decision making. Two tools were formulated based on the literature and interviews: an evaluation tool for unattended RPA and an evaluation tool for attended RPA. The tool for task evaluation for unattended RPA is presented in Table 9. The questions for the tool were collected and formulated based on literature and the interviews. The foundation for the tool was modelled based on the theories of criteria for RPA by Asatiani & Penttinen 2016, Fung 2014, 2, Haliva 2015, and Seasongood 2017 that are presented in Table 6 in Chapter 2.4. The interview questions about the theme choosing tasks for automation (presented in Table 7 in Chapter 3) were phrased on the basis of the theory, and the tool was completed based on the answers to the interviews gathered in Table 8 in Chapter 4.1. The tool´s questions for basic information were

shaped to meet the client organization´s demands. The actual tool is in Excel format and it works in a way that there are questions with Yes/No options, and if the answer suits automation there is a color sign displayed in an evaluation column. If there is financial information used in the cost evaluation, the tool will calculate the result. Beside the simple evaluation questions, there are determinations that demand case-by-case consideration. Together the evaluation questions and determination form a conception of whether the task is suitable for automation.

Table 9. Representation of the task evaluation tool for unattended RPA.

Subject	Questions and determinations	
1. Basic information of a task and a customer	Process	
	Sub-process	
	Task	
	Description of the current manual process	
	Description of what should the outcome of automation	
	Date of assessment	
	Process Owner (SME) and Service Manager (Back-up resource)	
	Customer information (name, market country, source country)	
	Profitability ratio of the customer Profitability ratio of the task	
	Languages involved	
	Pricing type	
2.Process suitability for automation	Are all the data processed in the process is in digital format?	Y/N
	Are all the data used in the process is structured?	Y/N
	Are there clear rules to process the task?	Y/N
	How many % of the cases to be handled can be deduced by unambiguous rules without exceptions?	%
	Are there clear steps described from step to step?	Y/N
	Could a summer trainee perform the task solely on the basis of the manual?	Y/N
	Does the task include an analogue step?	Y/N
	Are there decision-points where human judgement is required?	Y/N
	How high is the Process standardization?	%
	Does the process itself need improving? Description of the changes needed	Y/N
	How many accountants do this process? Are all of them doing this task exactly the same way?	Y/N
	Is the task similar to some other task that is done currently?	Y/N

	Is there similar tasks done for another customer?	Y/N
	Will this task be done for more than 12 months?	Y/N
	Can the handling of exceptional cases be the responsibility of designated persons in a centralized team	Y/N
	Automation enhances customer service experience	Y/N
	Automation accelerates the introduction of new services on the market	Y/N
3. Software and System environment	Application(s) used	
	What age are the current software base?	
	Are there applications used through virtualization layers / eg Citrix)	Y/N
	Does the systems used work steadily and every time the same way	Y/N
	The interval between updates affecting the system environment (less than 20pv, 30-90, over 90pv)	
4. Profitability, costs, and benefits	How many times the task is done per year	
	Duration in minutes per task	
	Duration per year	
	FTEs per year	
	Are there major seasonal variations in performance	Y/N
	The team now has a resource shortage or important tasks are left untouched	Y/N
	What is the time limit for the task to be done?	
	Internal labor cost of an accountant	€
	Savings potential	€
	Implementation lead time	
	Internal labor cost of developer	€
	RPA license	€
	Robot server to run the license	€
	Commercial benefit	
	Customer benefit	
	Employee benefit	
5. Risk evaluation	Are there any changes planned to: The task itself Application(s) Law	 Y/N Y/N Y/N
	Obstacles/ Risks of the special features of the particular task	
	Has there been many mistakes in doing this task? What is correctness ratio?	Y/N
	Does the errors in the process pose significant risks?	Y/N
	What is business impact of fault/mistake?	
	Errors cause costs in other processes (K € / year)	
	What quality ratio is expected after the automation transition?	

	How often the data should be validated?	
	Is there any test data or test situation?	Y/N
6. Development point of view	Development complexity	
	Development priority	
7. Decision	Automation	Y/N
	Unattended RPA	Y/N
	Attended RPA evaluation	Y/N

The tool for determining tasks for digital workforce has questions and definitions that are divided into 7 subjects. The first subject collects the basic information about the task, and the customer for whom the task is performed. From automation point of view, the most important determinations are the descriptions of how the task is currently done manually and what the outcome of the tasks is. There can also be expectations of the wanted outcome of automation. The information about the customer is not as relevant from the automation point of view, but it is pertinent to the organization. The second subject is the suitability of the process for automation. The first three questions are the deal breakers. These questions are about the basis of automation with RPA, all the data processed in the process has to be in digital format (or to be easily transformed to digital format). Moreover, all the data used in the process has to be structured, and there needs to be unequivocal rules to process the task. Other questions are for evaluating the current task more deeply. Many details affect whether the task is suitable for automation, and some details are task-specific. The third subject is to evaluate if the used systems and software endorse RPA and to evaluate the effort of RPA development.

Profitability is an important subject for an organization´s decision making. Organizations have limits for savings per man per year, financial limits or both, and the evaluation tool in designed to encounter both. Some tasks are evaluated in money, for example, tasks that are currently outsourced and could be brought back to the organization with RPA. A task that is currently done in the organization is more commonly evaluated with time and money, as costs are measured in currency, and benefits can be considered either in currency or based on indirect estimations. Risk evaluation has determinations that are common to all tasks, and there are many features that need

to be considered task-specific. The development point of view can be shortly considered at the evaluation point, but it will demand a more profound estimation after the decision has been made. The decision is made based on the answers and considerations of the topics presented above. If the task is not suitable for unattended RPA, it is possible to evaluate the task from the attended RPA perspective. When the license fee is lower, and the process from idea to automation is shorter and demands fewer people involved, the overall costs are lower. This means that automations that have too little potential in savings or that are in repetition, could be possible to automated with front office robots. If an organization has internal capability to make attended RPA, it is an easy and quick way to improve efficiency. If the scripts had to be bought from an outside partner, the costs could rise notably. The description of a tool for evaluating if a task is suitable for attended RPA is presented in Table 10. The tool was developed based on this research. The theories of attended RPA from Uipath 2017, Arrowdigital 2018, and Untrite 2017, presented in Chapter 2.4, created the basic understanding of attended automation. The interview questions about the themes choosing the type of RPA and choosing tasks for automation that are presented in Chapter 3, were based on the theories. The tool for the task evaluation of attended RPA was formed based on the interview answers presented in Chapter 4.2.

Table 10. Task evaluation tool for attended RPA.

Subject	Qualifying questions
Duration	How often the task is done in a month?
	How long does it take to perform the task manually one time?
	How many workers are participating in the task?
	→ Man years
Process	How complicated is the task process chart?
	How many different systems are used?
	Are there systems used that demand human to log in?
Timing	Is there a relevance of which time of the day the task is done?
	Is there a relevance after which task it is done?
Development	Are there skilled developers among the task experts? Teaching case?
	Development costs
	License costs
Synergy	Are there other tasks that could be automated with the same robot?

When evaluating a task for automation, it is important to measure what the savings and/or benefits are and if the task can be automated with any type of RPA. Similarities with the main task evaluation tool are that the basics of the character of data and profitability have to be defined first. Differences come with the demands of savings and the repetitiousness of the task. Attended RPA can also be the solution if there are such systems used in which entry cannot be granted entry to a robot, for example, if a personal identification number is needed for granting a login. The intention of the task evaluation tool for attended RPA is to raise the possibilities for a task to be automated, even if the task fails the first evaluation with the tolerated limits of certain aspects. Savings per man per year, systems demanding human log in or points where human decision is needed but automation can perform the preceding work and continue after the decision has been made, can be evaluated with a new perspective. It is important to see the causal effects when evaluating the processes: what the source of data is and whether it demands editing, how the data needs to be processed, and what happens after the data is processed. The overall picture needs to be considered for automation to be complete.

6 Discussion

6.1 Verifications of the findings

In the literature review there was presented criteria for RPA in Table 5 that was collected from three different sources. Considering the research foundings it seems that the evaluation in the theory is more technology-oriented when compared to the practical needs that were highly represented in the research results. For example the three deal breakers that were found in the research are not considered as a criteria for a process to be automated. The three deal breakers that are: all the data processed has to be in digital format, all the data used in the process has to be structured, and there needs to be unequivocal rules to process the task, are described in the introduction of RPA which means that they are acknowledged in the literature, but the meaning for real life purposes is more significant than what could have been assumed from the theory. According to the theory an opportune process for RPA is one with high volyme of transactions that are done in multiple stable systems, and

with measured expences. The process has unambigious rules with only few exceptions and the task does not include cognitive decision making. The research suggests in Table 8 that the amount of transactions, and the time spend in one transaction is the main criteria for effectiveness. Systems and processes need to be stable and have only few excptions. The main difference between theory and research was that, in the research it came clear that beside the high potential of the process, also the low effort of RPA development is considered as important criteria.

Process mining was described in Chapter 2.1 as a way to measure the current manual work in the literature review, but it came clear that none of the organizations were using that technique and measuring was conducted via estimations, and there were hestitations about how and what to measure. The measuring affects on the benefits that can be attained when using RPA. In the literature review the benefits were divided to cost reduction, productivity increase which includes customer experience uplift, and employee outcome, as seen in Table 2. Cost reduction clearly outlined from the research material, and it was the benefit that was measured by the organizations. Other benefits were in a secondary status as they were recognized but the realization was not followed as minutely. It was interensting that the ROI was only mentioned in the subordinated clauses, and it did lose cast to the figures of saved man-years. However the theories in Chapter 2.3 presented that ROI gives more detailed information about the success of the RPA, which would assumingly be a reckoned measurement. Risk management needs to be contemplated from many angels when considering automation with RPA. The literature review presented risk types in Table 3 that were also found from the research findings, only executive risks were less attentive. Technical and operational risks stand out because RPA is a technology that is depended on the operations and functioning of other systems used. The meaning of cybersecurity is increasing, and it was comprehensively considered in the research organizations. Therefore the research brought up noteworthy conceptions about risk protection.

At the beginning of the research there were determined two main research questions: **What makes a task opportune for RPA?** and **What factors influence the**

choice of the suitable type of RPA solution? The research was carried out, by introducing to the literature, semi-structured interviews, and document analysis. The information collected was analyzed, and some patterns were to found. In wide perspective, it can be determined that the task is suitable for unattended RPA if it has high potential, and low effort to be automated, and it creates benefits to the organization. The deal breakers are that all the data has to be structured and digital and processing the data needs to have unequivocal rules to follow. The factors that influence the choice of the suitable type of RPA solution are duration, timing, and complexity of a task, compared to profitability and skills. Hybrid workforce is already realized in many organizations but, according to this research, the form of hybrid workforce is often human workforce with only unattended RPA. By leaving out attended RPA, there remain tasks that could be automated with RPA, when the costs and structure are lower. Internal capability is the key for an organization to turn the attended RPA to good account. The challenge of attended automation is that not all RPA software providers support the attended RPA technology. In practise it is mainly a technology of one provider, UiPath, which can affect on the future development of hybrid workforce, or it can also mean that other providers need to reconsider their repertoire. The scripts of unattended RPA can be made to resemble attended RPA, for example to sent an email to activate automation, but the benefits of lower license fees and lighter structure are not gained when automation is done on back office robots. If the organization easlily adaps new software the answer can also be an open source solution, which can in the future play some role in the field of attended RPA.

The research gives support to the decision making when organizations are deciding how to automate their processes and tasks. This research offers more information of RPA, which have not been researched widely among finance and accounting. For myself this research gives many opportunities to learn and to increase my knowledge about automation and RPA. The methodology and the methods chosen were appropriate to this research, because in the future, when RPA is more widely in use in organizations, there could be done a quantitative research about this topic, but because the number of organizations using RPA at the moment is limited, the only way to explore this topic is qualitative research, and interviews as a primary data source.

Interviews were a befitting source for information from different organizations, and people working in different roles with RPA. Interviews and the research documents also clarified the practices organizations have when they are evaluating tasks for RPA, differences and similarities were elicited. The research documents supplement the research data, because in documents exist precise information about the processes of choosing tasks for automation, as it includes all the little details that can be bypassed in interviews. The documents are reliable sources because they are made for the organizations own use, and they are at the moment being used, which ensures that the data is topical. The similarities and resemblances were to be seen within the sample, which would relate that the sample size was appropriate. If there were more resources the sample could be even larger, but as such this research is adequate. The interviewees were all professionals and gave a great deal of valuable information that I could not have got from other sources. The interviews were mostly online interviews because of the distances and challenging time-schedules. Fortunately, all of the interviewees were very common on using Skype for business, and told that it is their everyday tool in working life which made the conversations fluent.

Attended RPA and pricing information proved to be challenges to the validity of this research. From the four organizations interviewed, only one was using attended RPA technology, one was interested in using it in the fututre, and two orgaizations did not conseider attended RPA as viable alternative. The reasons why organization have not considered attended RPA were that the RPA technology used does not support attended RPA, or organizations feel attended RPA has too large user risks at the moment. According to this research the key factor to advocate attended RPA is the employees capability to incorporate the technical requirements of RPA to their substans areas. This also means that automation is very bind to certain people, which can be considered as a risk factor. The pricing information was challenging to receive because it is not public information, and organizations were not willing to share their costs. The amount that is presented about differencies in pricing between attended and unattended RPA is based on real ratio of the price in one organization. The literature presented three common RPA pricing models, which means that this research only covers one example.

6.2 Recommendations for future research

The tool for evaluating tasks for RPA was just presented in this research, but monitoring how the tool works in practise would demand further research. It would also be interesting to explore, whether attended RPA with front office robots would be easier in the change management perspective, because automation is more visible with attended RPA, and employees become to be more involved which could affect in trust building with RPA. This angle of research could bring out new perspectives, and clarify the differences between attended and unattended automation. RPA constantly evolves, and new users are implementing RPA. Organizations require solutions for their individual tasks, used in different software systems, and RPA can be a versatile solution for many organizations. New intelligent technologies are introduced, and they will change the automation field, but RPA can still be used together with them. The skills of human workforce are also evolving with the technological evolution, and perhaps in the future an accountant can easlily code an assistant software robot to help with the manual work.

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