# IMPLEMENTATION OF ROBOTIC PROCESS AUTOMATION

Case Company X Oy

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Master's programme in business management and entrepreneurship **Abstract**

Visamäki

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ABSTRACT

Robotic process automation, or RPA, is the application of technology, that allows humans to configure software to capture and interpret existing applications to process transactions, manipulate data, trigger responses and communicate with other systems. In the same way industrial robots have been transforming the manufacturing industry, RPA robots are revolutionizing back-office work.

The objective of the thesis was to generate a guide for the case company on selecting the processes for RPA, what things to consider and how. The aim of the thesis was to generate suggestions on which processes the case company should automate with RPA next, with the focus being in the evaluation process of RPA ideas. RPA model, strategy, solution, roles and responsibilities, and the implementation process of the case company were described. The financial department of the case company was focused on. Its departments and their RPA needs and limitations were described. Case Company X Oy is a Finnish multinational retail company, which had a few processed automated with RPA before the thesis process began.

As a result of the thesis, the case company has a better understanding of their RPA possibilities and limitations. The generated guide can be utilized to determine, which processes they should automate with RPA. Concrete ideas for next processes to be automated were also presented at the end of the thesis.

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TIIVISTELMÄ

Ohjelmistorobotiikka, RPA, on sovellus, joka voidaan ohjelmoida keräämään ja tulkitsemaan dataa olemassa olevista sovelluksista sekä käsittelemään tapahtumia, muokkaamaan dataa, ajastamaan toimintoja ja kommunikoimaan muiden järjestelmien välillä. Samaan tapaan kuin tuotannolliset robotit ovat muuttaneet valmistusteollisuutta, ohjelmistorobotiikka on mullistamassa toimistotyön.

Opinnäytetyön tavoitteena oli luoda Yritys X Oy:lle opas, jonka avulla voidaan valita prosessit, jotka automatisoidaan ohjelmistorobotiikan avulla, mitä asioita ottaa huomioon ja miten. Opinnäytetyön tarkoituksena oli saada aikaan ehdotuksia prosesseista, jotka Yritys X Oy voisi automatisoida ohjelmistorobotiikalla seuraavaksi. Yritys X Oy:n RPA malli, strategia, ratkaisu, roolit ja vastuut sekä käyttöönottoprosessi kuvattiin. Yritys X Oy:n taloushallinnon prosessit olivat keskiössä ja sen osastot sekä niiden RPA tarpeet ja rajoitteet kuvailtiin. Yritys X Oy on suomalaislähtöinen monikansallinen vähittäiskaupan yritys, joka oli automatisoinut muutaman prosessinsa ohjelmistorobotiikkaa hyödyntäen, kun opinnäytetyöprosessi alkoi.

Opinnäytetyön tuloksena Yritys X Oy:llä on parempi ymmärrys heidän RPA mahdollisuuksistaan ja rajoitteistaan. Opinnäytetyön tuloksena muodostunutta opasta voidaan käyttää RPA ideoiden arvioimiseen ja vertailemiseen. Opinnäytetyön lopussa esitettiin myös konkreettisia ideoita seuraavista automatisoitavista prosesseista.

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# 1 Introduction

When we think about robotics, the first things, which come to mind are usually Terminator-type machines or other physical robots. Software robotics, or RPA, is quite different, because a software robot is not something you can touch. It is a program, which you can code to perform in a way a human would: pressing keys, clicking and interpreting information and making decisions based on that information. However, you have to tell a software robot all possible situations it might encounter; it cannot perform in a situation it does not know. (EY, 2016, p. 1-2)

Today, tasks automated with RPA can be seen in various places and processes. In customer service, RPA operated chat bots are utilized as the first line of defence and a useful tool in distributing leads and providing basic, easy-to-find information to customers by teaching the software robot key phrases and questions. An insurance company can cut processing times and manual work dramatically, while also eliminating human errors, by teaching RPA to handle premium advice notes. (Willcocks, 2017)

In accounting, different batch jobs, in example billing runs and checking invoice data, and reconciliations are among the most common processes to be considered for RPA. RPA, among other automatization applications, is drastically changing ways of working. (Peccarelli, 2016)

According to Arntz, Gregory & Zierahn (2016, p. 25), robotics is not going to make humans futile in the workplace. Some jobs will no doubt be eliminated, but others will be created in the process. Manual work, which does not rely on human decision-making, will be done by robots, but monitoring and developing jobs are created, when more robotics are made use of. The problem for an individual arises, if he or she is not capable of adapting to this new environment by learning new tasks.

As stated earlier, robots cannot do everything. The processes, and parts of processes, which could be automated with robotics has to first be identified. The identification process requires understanding of the process itself, its motives, steps, requirements, et cetera, as

well as a deep understanding of the capabilities of robotics. If the motives of the process are not clear, when automating it, unnecessary processes can be automated or the real reasons, why the process is done in the first place, might be overlooked. Process walkthroughs are just as essential as automation itself. (Dorr, Frank, Kracklauer & Rombough, 2016, p. 2-3)

The thesis focuses on the process of identifying the processes, which could be automated with robotics as well as creating a guide for the case company on how to go through the process selected for RPA. The case company, referred to as Company X Oy, has recently implemented the first processes automated with robotics. It is looking for new processes to be automated using robotics. The thesis will also give the case company ideas on what those processes could be using the developed guide to go through them.

## 1.1 Objectives and the outline of the thesis

The objective of the thesis is to generate a guide for the case company on how to select the processes for RPA, what things to take into consideration and how. By using the guide, the case company will be better equipped in determining, which processes they can and, more importantly, should automate with robotics.

The thesis focuses on the process of evaluating possible processes to be automated with RPA, so the guide can be exploited in all areas of the business. As a result of the study, there will be a suggestion for the case company, which processes should be automated with RPA next.

Some remarks and observations are also made regarding whether the case company should buy the coding of the robot from a supplier or should they do it by themselves.

The main research question is:

How to select and conduct the processes to be automated with RPA?

The research sub-questions are:

How should the possible processes to be automated with RPA be approached?

Which processes should be automated with RPA next?

Should the coding of the RPA project be done by an outside supplier or in-house?

## 1.2 Research methods and the structure of the thesis

Theoretical framework consists of a theory base, which is gathered mainly from professional literature and articles, but also videos and webinars. Internal material of the case company has been utilized as well.

Theoretical framework is comprising these four main topics:

- Company introduction
- Process automation
- Robotic process automation
- Process development

Company introduction is relatively brief, since the case company preferred to be referred as Company X Oy. Process automation and Robotic process automation are described after that. Robotics is the focus of the thesis, so it is defined in more detail. RPA is only of the methods of process development, which is also included in the theoretical framework.

The thesis is a practical development task. The author will familiarize himself with the ways other companies approach new ideas for RPA automation and what processes they have selected. A lot of information about the subject is available, since the technology is relatively new, so most implementation projects are quite recent. Many case studies for different companies cover the subject as well.

The research will be performed as a qualitative study. The thesis is commissioned by the case company, so case study method fits well for this purpose. Observation method is used

as well, because the author is familiar with the company. Notes from the RPA project are utilized. Internal material of the case company is also used as a basis of information.

Qualitative study means research, which aims to achieve results without statistical methods or other quantitative methods. Qualitative research thrives to understand the phenomenon on a deeper level. The objective of qualitative research is to describe, understand and make a meaningful interpretation of the phenomenon. Analysis is a major part of qualitative research; it is part of the research process, not the final part of the research. (Kananen 2008, p. 24)

Quantitative study provides an overview of the relationships and differences between different variables. It answers the questions how much, how many and how often. In quantitative research, information is handled in a numerical form. Data has to be transformed into a numerical form, if it is in another form. The goal of a quantitative research is to either explain, describe, compare, predict or chart things or qualities concerning humans or nature. (Vilkka, 2007, p. 13, 18)

The boundary between qualitative and quantitative research is often considered to be quite steep. The differences between the two do not just derive from different research methods; the nature of the research subject also differs. Quantitative approach is associated with the conception of the research subject acting according to natural laws. The conception of qualitative research is that it denies the aforementioned approach. (Tuomivaara, 2005, p. 28)

The main difference between qualitative and quantitative research is how the world is depicted. While quantitative research settles for concepts of classification and comparison, the concepts of interval and ratio can be utilized in qualitative research. However, the usefulness of the concepts related to the research subject has to be questioned. Quantitative research is often considered the more precise one of the two, since there are fewer variables and the relationships between them are clearer. (Tuomivaara, 2005, p. 30-31)

Observation method is a useful tool in finding out, whether people are actually behaving in a way, which they are saying. There are many methods for observation. Observation can be

systematic or participatory. Observer is an external actor in systematic observation, but participating in the group action in participatory observation. (Hirsjärvi, Remes & Sajavaara, 2007, p. 207-209)

The research begins by gathering information about, how other companies have implemented RPA to their business, how they select and assess the processes to be automatized with RPA and how they approach the processes. Information is gathered through thesis based on the subject, other studies and articles about the subject, in addition to interviews.

According to Hirsijärvi, Remes & Sajavaara (2007, p. 199, 203), interview is the main method of collecting data in qualitative research. Theme interview means that the themes of the interview are known before the interview, but the questions and their order have not been formed beforehand. Theme interviews were utilized in the research.

## 1.3 About the case company

The case company prefers to be referred as Company X Oy in the thesis. The case company is a multinational retail company based in Finland. The revenue of the company in 2020 amounted to EUR 720 million. Company employed over 700 employees on average during 2019. As of 2021, company operates in three countries. (Company X Oy, 2021)

The growth of the case company has been fast during its existence and the plan is to continue the rabid growth in all of its operating countries. One of the core values and keys to its success has been the company's agility and low over-head costs. This has enabled many major business decisions as there is no rigid back-office organisation to manoeuvre. (Company X Oy, 2021) RPA, and automation in general, fits to this well, since the point of automation is to perform a process with minimum human assistance. (Lacity & Willcocks, 2016, p. 40-49)

Being a rapidly growing retail sale organisation, the focus is always in the sales and purchases. Back-office processes have been developed heavily in the past years to keep up

with the growth. RPA has not been utilized much yet. RPA is seen as viable way of streamlining processes even more. (Company X Oy, 2021)

# 2 Process automation

This chapter focuses on processes, process automation and process development. Before automating a process, we have to identify and understand the process, its sub-processes, process areas and its role and importance to the organisation. Automating the "wrong" process has less benefit to the organisation and it might even be harmful. (Sharp & McDermott, 2008, p. 34-35, 93)

Process development and process-thinking have been reviewed in business literature for many decades. Determining the business processes of an organisation has been identified as a major issue facing organisations, since it is not simple to recognise the business process from its sub-processes or from process areas, especially in a large organisation. (Harmon, 2014, p. 2-3)

Business processes can be defined as processes, which go through the organisation to create value for the customer. What is important to recognise regarding business processes is that they cut across different departments. Each department has its own sub-processes, which are part of the actual business process. (Harmon, 2014, p. 2-3)

## 2.1 Process

According to Sharp & McDermott (2008, p. 28), a process is a way of organizing work. In example, a craftsman might perform the whole process, of acquiring the necessary materials, creating the product, marketing and selling, him- or herself focusing on delivering the end product to the customer. In this simple model it is clear in all the steps of the process, what the objective of the process is (delivery of the final product to the customer) and what are the roles of all sub-processes in the main process. However, the process is slow, not scalable and it does not allow the craftsman to focus solely on his or hers area of expertise. The work can be organised to different people or departments, who are experts in a specific sub-process of the business process, in example marketing or sales, to make the

business process more effective. In this model, it is easier for a sub-process to lose sight of the main objective of the business process and become disconnected.

Martinsuo & Blomqvist (2010, p. 5) describe process as “Processes are customer value-adding chains of activities that utilize resources”. In this description, a customer is not necessarily the end customer of the company, but a separate party, internal or external, which has requirements or needs toward the process. Added value is the difference between output and input of the process and it can be a product, a service or some other form of fulfilling the customer’s needs. Chain of activities are the activities of which the process is formed out of, which can also be described as work. Process needs resources, which can be anything from raw materials or workforce to capital or knowledge. The supply of resources is limited. (Martinsuo & Blomqvist, 2010, p. 5-6)

A collection of activities, which are performed to get something done, can be described as a process. (Sharp & McDermott, 2008, p. 38) To define a business process, we have to apply other criteria to a process as well (Sharp & McDermott, 2008, p. 39-45):

- Involves work
- Named in verb-noun form (in example Acquire New Customer)
- Delivers a specific and essential result
- Initiated by a specific event
- Includes an organizing framework

With these criteria, a business process can be identified. It is also described in the Figure 1.

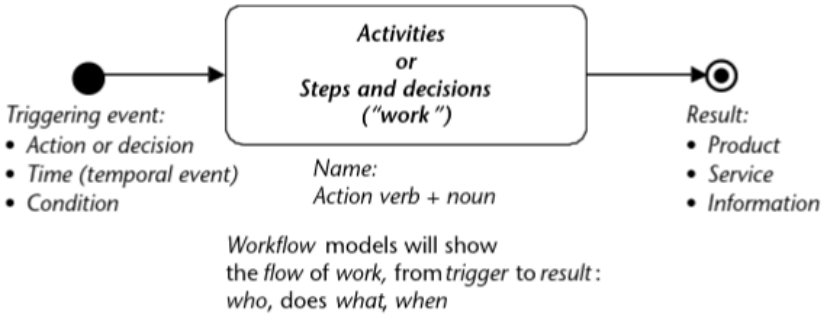


Figure 1. Essential components of a process (Sharp & McDermott, 2008, p. 45)

Processes have a starting (trigger) and an ending (result) point. It can be difficult to separate the processes steps from its sub-processes' steps. To help with this process, Sharp & McDermott (2008, p. 51-52) suggest a 1:1 connection analysis to recognise whether sub-processes, activities, tasks or steps are part of a business process. The basis of this analysis is to compare the trigger and the result of two sequential processes to see, if there are other possible processes, which precede the second process or which come after the first process. If there are none, and the first process has to precede the second process and second process has to come after the first process, we can conclude, that the processes are part of a business process. The Figure 2 clarifies the analysis.

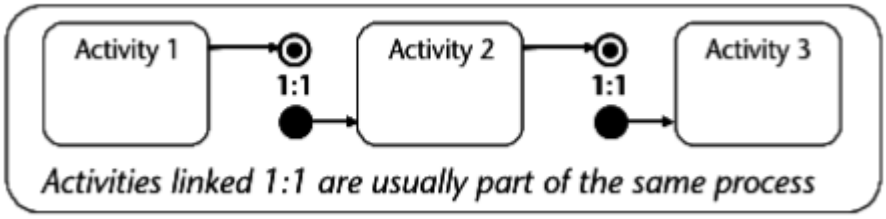


Figure 2. Guideline for compiling activities into business processes. (Sharp & McDermott, 2008, p. 52)

## 2.2 Process improvement

Before improving or developing processes, an organisation must identify and assess their existing processes. Improvement should not be done only, when problems or issues arise. In a working process-focused organisation, process improvement is continuous. (Sharp &

McDermott, 2008, p. 65) This is depicted in Figure 3.

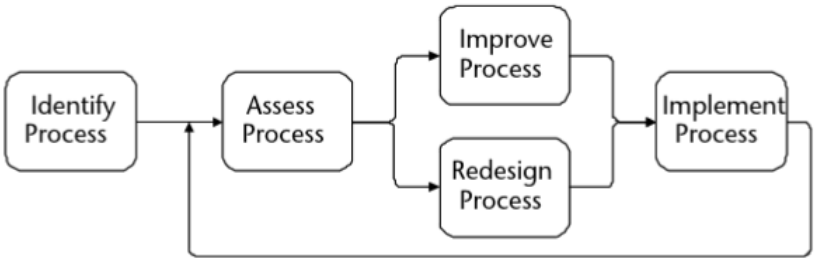


Figure 3. Merging of process reengineering and continuous process improvement (Sharp & McDermott, 2008, p. 26)

To make the process of improving processes more tangible, we can break it down into three phases (Sharp & McDermott, 2008, p. 65):

1. Establish the context, scope and goals of the process (identify process)

2. Understand the current process (assess process)

3. Define the new process (improve or redesign process)

The first phase includes recognizing related business processes and dependences as well as establishing a target state for the process. In the second phase, the process workflow is modelled and the factors affecting process performance are initialized. The third phase comprises the final assessment of the process in its current state, determining potential improvements and choosing, which ones should be implemented and modelling the new process workflow. (Sharp & McDermott, 2008, p. 65-66)

According to Martinsuo & Blomqvist (2010, p. 8), if an organisation is practicing performance improvement through process development, it might mean, that the organisation is shifting their approach to a process-oriented one, implementing a new process, modifying existing processes radically or improving existing processes. In any case, the steps should be similar. These steps are presented in Figure 4.

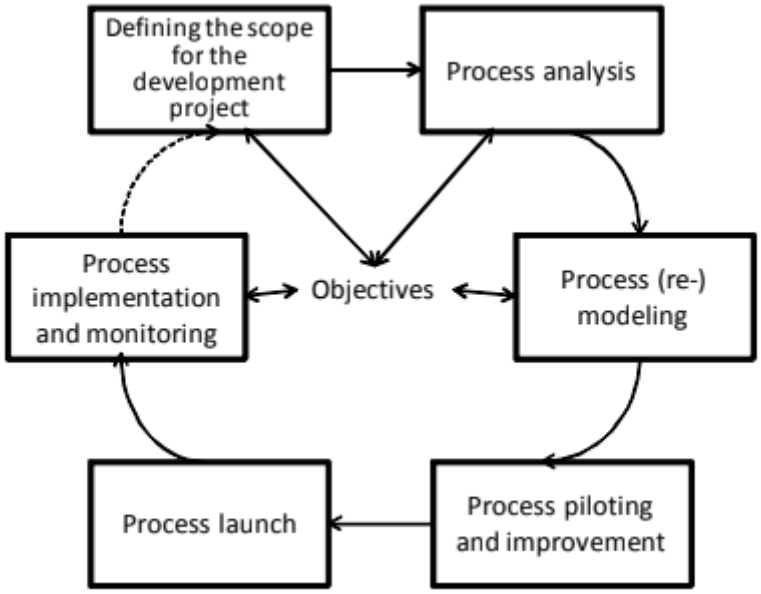


Figure 4. Basic steps in process development. (Martinsuo & Blomqvist, 2010, p. 8)

Process improvement project will most likely not have a desired outcome, if the scope of the project is not specified. The organisation's objectives should be considered, when determining the project scope. Also, the processes, which the project will affect, have to be specified. (Martinsuo & Blomqvist, 2010, p. 9)

Data collection is an important part of a process development project. Data can be collected through various methods, but it is beneficial to utilize methods, which gather easily measurable data, such as data mining, as well as methods, which illustrate the process's functionality more effectively, such as interviews or workshops. Regarding a new process, the activities, which add value in the process, have to be considered as to how they were handled before. (Martinsuo & Blomqvist, 2010, p. 9)

Often the project is involving only a sub-process, a task or an interface between processes. Even so, the target process should be tested in an actual environment, or a simulated one, to discover all possible mistakes before implementing it in full-scale. The real experiences of the testers are also very useful and hidden issues or possibilities might be discovered based on these, and modifications are much easier to do on a process, which is not yet in use. (Martinsuo & Blomqvist, 2010, p. 9)

Communication of the new ways of doing things, the changed guidelines and the development of the project to the people impacted by the implementation of a new or modified process should be consistent. Training and comprehensive instructions are also integral. Additionally, it is equally important, that the organisation's management supports the implementation. (Martinsuo & Blomqvist, 2010, p. 9-10)

## 2.3 Process automation

Organisations, which are seeking to capture the full benefits of service or process automation, have to take a long-term view. The benefits gained from automation are higher, if the organisation has a thought-out automation strategy, rather than using automation to achieve quick wins without considering the broader perspective. (Lacity & Willcocks, 2016)

It is crucial for the success of the automation strategy, that the automation mind-set is adopted by the management team and managers of the organisation. If there is no support from the top, the applications of automation projects might only be superficial and concrete benefits will not be achieved. If, however, the management is engaged in the project, the benefits might very well be even better than expected. (Lacity & Willcocks, 2016)

Automation can have several benefits (Lacity & Willcocks, 2016):

- Cost savings
- Improved customer experience
- Higher employee satisfaction

Cost savings usually come from reduced man hours spent on manual work. They might also be a result of a more efficient process caused by a diminished need for administrative or IT services. A faster response time to customer contacts due to a software robot handling the first response or a more effective process for handling customer leads can generate a better customer experience, among other possible automation possibilities. Employees do not have to trouble themselves with the manual, boring tasks, if the tasks are automated with a software robot or an interface between different systems. This should create higher

employee satisfaction as the employees feel more engaged with more meaningful tasks. (Lacity & Willcocks, 2016)

Lacity & Willcocks (2016) state, that usually the most beneficial automation projects originate from business operations. Business operations are at the forefront of the organisation, so they are in the best position to understand, which automation projects will produce the optimal return for the customers and the employees. The business operation managers can see the end-to-end processes, identify the format of the data required for a certain task and the tasks, which need human judgment. However, other business areas, especially IT, should be involved early on in the project to avoid oversights and –laps.

According to PwC (2017), process mining tools are useful, when determining the bottlenecks of processes and discovering the areas, which would benefit the most from automation. These tools are designed to further the understanding of processes by going through data and analysing it. In a complex process, it might be tough to see the actual process from its tasks or software's used for the tasks. Incorrect perception of the process might lead to the interpretation, that the process includes more manual tasks, which require human interference than what is the reality.

Usually, implementation of automation tools does not mean the end of human labour in the process. Human decision-making and grasp are still required in most cases at some tasks of the process. This might mean, in example, a software robot going through a set of contracts for the auditors, leaving only the ones, which have discrepancies compared to previously set rules, for the humans to go through. (Harvard Business Review, 2019)

# 3 Robotic process automation

Robotic process automation, which is commonly abbreviated as RPA, is described in detail in this chapter. Its commonly used applications and limitations are defined. RPA implementation process can be a challenging one, if not well prepared. Finally, RPAs applications in the finance department are described.

## 3.1 What is RPA

RPA is the application of technology, that allows humans to configure software to capture and interpret existing applications to process transactions, manipulate data, trigger responses and communicate with other systems. In the same way industrial robots have been transforming the manufacturing industry, RPA robots are revolutionizing back-office work. (Institute for Robotic Process Automation, 2017)

Classically, processes, that would benefit the most from RPA are repeatable and have predictable interactions with applications. Especially processes, that require shifting between multiple IT applications (swivel chair), in example, retrieving data from a system and entering the same data to another system. (Lowes, Cannata, Chitre & Barkham, 2016)

It is in the organisations best interest to get as much of the required data in an optimized way through the same outlet, to avoid the swivel chair situation. However, this only happens in an ideal world and the reality is, that at least some information is received through different outlets in different formats and they need to be compiled with, in example, manual labour or using a software robot. (Lacity & Willcocks, 2016, p. 14-15)

If a software robot can reduce or eliminate manual labour in a process, it is a very attractive option for companies, since the license of the robot is usually less than what a staff member would cost. The robot does exactly what is told, so human errors are also eliminated, and the process is more predictable. (Lowes, Cannata, Chitre & Barkham, 2016)

A robot can be assigned to a process quickly, usually in a matter of weeks. Thus, the implementation costs of RPA are relatively low. Costly IT updates or changes might not be needed, since the robot can work using the same user interface as a human would. However, the processes have to be clearly and correctly described before adopting RPA into the process. (Lowes, Cannata, Chitre & Barkham, 2016)

RPA compared to its most common alternatives in Figure 5.

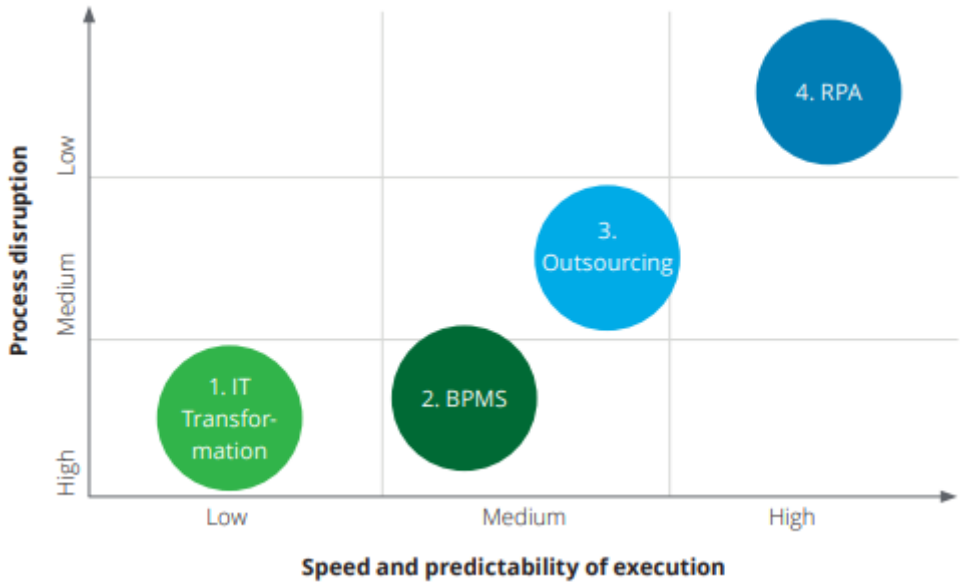


Figure 5. RPA compared to traditional process transformation approaches. (Lowes, Cannata, Chitre & Barkham, 2016)

In addition to being cost-effective, RPA software is easy to use. It does not require coding skills or formal training to learn. In most cases, the most effective way of adopting RPA is to teach the process owners, or people, who have an understanding of the processes to be automated, to code the robot, rather than hiring consultants to do that. This might also yield the best results, since fully understanding the process is the most important thing in an RPA project. (Lacity & Willcocks, 2016, p. 16)

To the confusion of RPA-minded organisations, there are three types of products and they are all commonly labelled as RPA. One of these is the RPA described earlier, and the other two are (Lacity & Willcocks, 2016, p. 5-6):

- Macros, scripting and screen-scraping

- Software development kits, or SDKs

Macros, scripting and screen-scraping offer fast record functionality. Essentially, the product records users keystrokes and mouse clicks. It can then later be performed in order to mimic human's activities or it can be set to be triggered by some process event. What makes it different from RPA is, that is does not "understand", what it is doing; it simply replays the set

of keystrokes and clicks it has been told. It does not have an understanding of where it stands in the process nor does it offer re-use. It is best used as a desktop assistant. (Lacity & Willcocks, 2016, p. 5-6)

SDKs offer IT development teams the possibility to build a robot of their own design. The developed robot can focus on individual scripts and offer localized transaction support. SDKs depend on local roles and user permissions, since they use a desktop security model. The development team has to be experienced and mindful of the pre-requirements in terms of methodology and best practice. One of the key differences between SDKs and RPA is that SDKs are designed for building individual robots, instead of robot teams. Because of this, SKDs do not offer, in example, multi-purposing, load balancing or synchronization, which are available, and required, for robot teams, or virtual workforce. (Lacity & Willcocks, 2016, p. 6)

Robotics and automation are different concepts, but they have a considerable amount of overlap. Automation can be seen as a mostly technical capability, which focuses on replacing human mechanical actions. Robots, on the other hand, are able to handle relatively cognitive tasks, which require understanding of the surrounding environment and other variables, and are expected to react differently in different situations. In example, a navigation system will react to a road-block by offering an alternative route. Or if you miss a turn, the system will adapt and give new instructions accordingly. (Herbert, Dhayalan & Scott, 2016) RPA falls in the automation category in this definition, since it is only able to process variables and situations, which has been described to it earlier. It cannot create new rules itself, as artificial intelligence (AI) is intended to do.

## 3.2 Common applications

Today's large and huge organisations tend to have comprehensive IT infrastructures and it is impossible to have everything in one system. There are systems like SAP or Microsoft Dynamics Ax, which offer almost all functions organisations require, but there are other IT systems, which handle specific business or back-office functions, such as organisation specific CRM or payroll, better, since they are specialized in that area. On top of that, there are, in example, emails and excel sheets outside of those systems but which are still widely used.

What sets RPA aside from IT systems, is that it is not part of the organisations IT infrastructure; it is on top of it. This means, that it is quick and rather inexpensive to implement, but also that it does not require expensive and sometimes difficult to maintain integrations between other systems. Perhaps a better way of viewing RPA is to see it as a proxy for human worker operating IT systems. (Institute for robotic process automation, 2015, p. 6-7)

A robot can gather data at the same time it is executing a process. This gives the organisation more information about the process and enables better informed decision-making. Once each step of the process is traced, it is easier to see, where there is room for improvement. Also, for highly regulated fields, such as banking, insurance or healthcare, well-documented processes are a requirement, which RPA helps to achieve. (Institute for robotic process automation, 2015, p. 11-12)

Whereas humans cannot work around the clock, at least not for long, a software robot can. It does not need breaks and it can be set to perform a process any time of the day, in example, to accommodate workers schedules. If a worker needs certain data, when starting the day, a robot can process the data at night and leave only the exceptions for the worker to process in the morning. Generally, a single software robot can allocate work to other more value-adding activities for two to five full-time employees. (Institute for robotic process automation, 2015, p. 12)

When a robot is performing the repetitive, time-consuming tasks previously done by humans, employees have more time to concentrate on more value-adding work involving decision making, personal interaction or problem solving. Employee productivity increases as they feel their work is valued. (Institute for robotic process automation, 2015, p. 12-13)

A robot will only make mistakes, if it has been coded incorrectly or if the process, which has been automated, has not been clearly defined. Human errors in the process are eliminated. However, because of human coding and human-made process definitions, a lot of testing, training and governance is needed to get the most out of the process. (Institute for robotic process automation, 2015, p. 13)

RPA can increase customer satisfaction. A software robot is available 24/7, so the customer can get answers and help faster. A robot does not forget to process leads or contacts as a human might. With the robot handling the preliminary work for, in example, a sale, a seller can focus more on the customer and the buying experience. (Lacity & Willcocks, 2016)

RPA is not confined to any specific industry, language, region, IT system, department, et cetera, which is one of its most dominant perks. It can be implemented practically anywhere, where there are rule-based, repeatable and structured tasks performed, and there is at least the possibility to do the tasks electronically. (Institute for robotic process automation, 2015, p. 15)

Organisations do not operate on the same level year after year and they benefit greatly from fast scalability. They might have to make cut-backs in a declining market or they might need to quickly increase the processed volumes in high demand. It is not simple to scale up or down in the short-term, when it comes to employees or IT systems. RPA offers scalability. (Institute for robotic process automation, 2015, p. 14)

RPA can operate within an organisation interacting with employees as either independent automation or assisted automation. Assisted automation requires human interaction, whereas independent automation does not. An ATM machine is an example of assisted automation. (Institute for robotic process automation, 2015, 18)

### 3.2.1 Limitations

Software robot needs very clear rules and structured data in order for it to be functional. Oftentimes in the real world, data available is not structured and the process is designed based on inference. Also, many processes have multiple possible likely outcomes, instead of one correct answer. RPA can only handle processes, which have clear outcomes, rather than multiple possible ones. Processes, that RPA is unable to manage, fall in to the realm of cognitive automation as described in Figure 6. (Lacity & Willcocks, 2016)

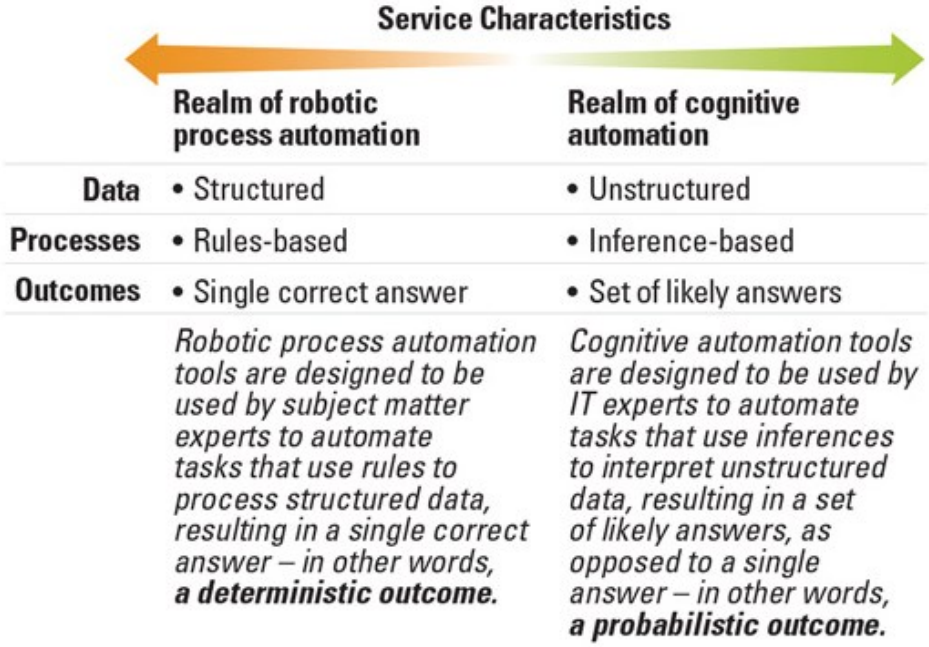


Figure 6. The Service Automation Landscape (Lacity & Willcocks, 2016)

In the future, RPA might be able to function in a more analytically, instead of just processing transactions in a pre-set way. This would mean, that a human would be able to teach the robot to learn from new situations it would face and adapt to them. Much like AI. These robots would be intended to assist humans in producing more informed and better decisions, not replace them. (Institute for robotic process automation, 2015, p. 22)

Even though RPA is quick and cost-effective to implement, back-end integration of IT systems is still inferior. It is designed for machine-to-machine communication, unlike front-end integration. RPA is a temporary solution, which helps with manual processes based on non-updated IT systems, before re-designing the process to work on fully automated systems. (Asatiani & Penttinen, 2016)

Usually, robots are programmed to do tasks, which were previously done by humans. Employees might be hesitant towards robotics, because they are afraid of losing their jobs. Surely, many jobs have been taken over by robots, and more will in the future, and not all people are able to adapt. (Asatiani & Penttinen, 2016)

Because RPA is so efficient in mimicking human's mechanical actions, it is easy to lose sight of actual issues in the process or in the system. There is a risk, that RPA users focus on quick fixes rather than addressing the root problem. (Holmlund, 2020)

Software robot is great tool in tracking the process steps and the errors it encounters. However, it cannot highlight a problem, unless it is told, or understand the gravity of the problem. This might lead to a situation, where a robot is encountering a problem, but it goes unnoticed in the organisation, whilst a human would have noticed the problem early-on and report it. (Holmlund, 2020)

Some processes and tasks are too risky to be done by a robot. Coding a robot to do them might require too many fail-safes for it operate and even then, it would need much supervision, so it would not make sense to robotize. (Holmlund, 2020)

RPA requires constant supervision and maintenance. Even with the ability to code the robot to work with the source code of the systems it uses, even slight changes in the system or its setup require maintenance to the robot. If the change does not have an effect to the robot, the change still has to be tested with the robot before implementation, so it does not break down, when needed. (Holmlund, 2020)

Many organisations use virtual environments, such as Citrix or Microsoft RDP. In essence, what it means is that it allows business applications to be run on a remote server and users are only displayed images from a desktop instance running behind a firewall. It is used to increase IT security, cut costs, improve availability and flexibility, and make maintenance easier. (PwC, 2018)

There are issues, when adopting RPA into processes, which include tasks in a virtual environment. The best practice is to code the robot to use source code, or the underlying UI elements, in order to locate and read things. In a virtual environment, this is not possible, because the users are only displayed the images of the applications. Therefore, the robot has to be coded using images, which is not failproof. Automating a process relying on images, or surface automation, is much more time-consuming and unstable. (PwC, 2018)

Implementation of RPA is fairly easy, but still requires a lot of input from the organisation, mainly because the processes have to be clearly defined before RPA can be introduced. RPA will not make an insufficient process better, even if it is done more efficiently. (Holmlund, 2020)

The implementation process, its steps and what to consider are described in detail in chapter 3.3.

## 3.3 Implementation process

In order to make the most out of RPA in an organisation, it is best to first sell the project to top executives. If the project has management approval and understanding, it is much more likely to succeed. RPA will affect the way work is being done in the organisation and even possibly eliminate some tasks. Therefore, it is crucial that the project has a green light from senior management. (EY, 2016)

Even though RPA does not inherently require changes in the existing IT infrastructure, it is recommended to involve IT department in the project from early on. IT support is valuable in the project and overlap between IT updates and RPA can be avoided. Technical issues, such as capacity planning, failover for servers and storage and response times, can be addressed accordingly. (EY, 2016)

Business case should be identified before starting an RPA project. The actual costs of the current process need to be calculated in order to successfully evaluate the return on investment, ROI, of RPA. (EY, 2016) ROI calculation of an RPA project is described in detail in chapter 3.3.1.

Developing, hiring or buying the skills needed to run a robotics development and maintenance department helps to identify issues, which would not otherwise come up before running the robot in live environments. Discovering and fixing the problems early on is much cheaper and easier than making fixes to the robot after implementation. (EY, 2016)

The steps of an RPA implementation process are described in Figure 7.

| | |
|---|---|
| 1 | Recognizing the process to be automated (user) |
| 2 | Checking the validity of the process and minimizing variations (user) |
| **3** | **Recording the process as it is done now (user & RPA expert)** |
| 3.2 | Questioning the steps critically is important (RPA expert) |
| 4 | Describing the process in a flowchart on a very specific level (RPA expert) |
| **5** | **Going through the process with the user (user & RPA expert)** |
| 6 | Comparing the cost of the RPA project vs. resources saved (user) |
| 7 | Starting the project (user & RPA expert) |
| 7.2 | IT should be informed (user) |
| 8 | Coding of the process (RPA expert) |
| 9 | Testing the automated process with the user (user & RPA expert) |
| 9.2 | Testing should be done a few times before go-live (user & RPA expert) |
| 10 | Go-live (user & RPA expert) |
| 11 | Monitoring closely, that the process is working without major issues and fixing remaining problems (user & RPA expert) |
| 12 | Checking the results of the automation process (user) |
| 12.2 | Calculating the actual resources saved vs. the cost of the RPA project (user) |
| 13 | Fine-tuning the process (user & RPA expert) |
| 14 | Automating more variations in order to decrease manual labor even more (user & RPA expert) |

Figure 7. Steps of an RPA implementation process. (Efima, 2020)

Recognizing the process, the first step of the implementation process, is actually containing multiple steps itself. Ideas from people, workshops and external consulting are examples how an organisation might get an idea of the RPA possibilities. After obtaining a list of RPA possibilities, organisation must prioritize them and start working on one or a few of them. (Efima, 2020)

All steps of the implementation process are important, but some are vital for the efficiency of the process and often overlooked. These are (Efima, 2020):

- The recording of the process as it is done now, while being critical to tasks being done

- Going through the described process in a flowchart

Both are tasks, which are done in co-operation between the RPA expert, an external consultant or in-house RPA developer, and the process owner or the people, who are doing the process. It is very important for the RPA expert to understand the actual inputs and outputs of the process, the value it adds to the product or service and the parties involved. Without an understanding of these, the software robot might be built to perform the process in sub-optimal or even in the wrong way. (Efima, 2020)

There are common challenges, which many organisations face, when adopting RPA in to their processes. These are (Efima, 2020):

- Complicated, incoherent and undocumented processes
- Poor quality of data
- Insufficient resourcing
- Change management

The most common obstacle in an RPA implementation process is understanding the process to be automated. Because of human behaviour, if many people are doing the same process, it is reasonable to assume, that they do it, at least a little bit, differently. The process has to first be agreed upon, as it is impossible to automize a process, which is not clear. As a general rule, it is best to start with a simple process and not go for the big and complicated one. (Efima, 2020)

The robot can easily understand structured data, such as excels and data tables, but unstructured data is a challenge. Often unstructured data would be possible to be created or presented in a structured form. The process should be reviewed in light of this and make possible changes. In some cases, it is beneficial to use an extra excel, where information is gathered for the robot to be easily interpreted. To ensure the validity of the automated process, all possible variations should be tested before implementation. (Efima, 2020)

The process is created for the robot in a sliced format, which means that the process is divided into sub-processes and tasks as much as possible, to make it easier to test single tasks, to re-use parts of the process and to make the process more coherent. Also, if the coders of RPA change, in example the coding of RPA is brought in-house, the code is much easier to understand, when divided into single tasks. (Efima, 2020)

RPA can create confusion, disengagement and unnecessary worry to the employees, if they are not informed about and included to the project. In example, naming the robot, celebrating small wins and presenting the robot as a new co-worker can help with bringing

the employees onboard. The desired outcome should be a cultural shift, where employees want to find more processes, which could be automated without them worrying about their own job. (Efima, 2020)

According to PwC (2017), the efforts needed for RPA implementation are often underestimated. The implementation process is expected to be very fast, but the reality might be different.

There are six main topics, which usually can be blamed for delays in the RPA implementation process (PwC, 2017):

1. Starting with complicated or too comprehensive processes
2. Organisation and governance
3. Dedicated resources
4. Change management and stakeholder management
5. Cooperation between business and IT
6. Selected approach

Organisation is best of, when implementing RPA for the first time, with selecting a simple manual and repetitive process for their first Proof of Concept, PoC, or pilot. They can achieve easy wins without delaying the project by months by selecting a large and complex process. (PwC, 2017)

It takes time to develop a functional RPA team, which can operate in accordance with the strategy of the organisation. Due to the popularity of RPA implementation projects, it is difficult to find the right talent to execute an RPA project. Organisations also prefer in-house experts to hired consultants, because it is usually more efficient. It takes time to develop the skills needed within the organisation. (PwC, 2017)

Change management is a vital part of an RPA project, since the implementation of RPA usually has profound effects to the ways of working. If not properly handled, the project might not get the best results, because of lack of effort from the employees, lack of ownership of the project or lack of buy-in to the project from senior management. Building the trust, confidence and know-how within the organisation takes time and effort. (PwC, 2017)

Cooperation between IT and business function regarding an RPA project saves time and resources. Otherwise, the division of labour between IT and business might be obscured and setting up the needed IT infrastructure might not be done, or done in time. RPA software should also be selected in cooperation with IT. (PwC, 2017)

Even though the best results in an RPA project are usually obtained by using people, who know the processes to be automated well, in the beginning of the project it saves time to utilize external assistance. It also gives the in-house RPA team more time to learn the RPA software well before having to do actual coding themselves. (PwC, 2017)

### 3.3.1 Return on investment calculation

RPA gets a lot of attention and its drawbacks and advantages are widely covered. However, it is quite common, that initial calculations about the returns of RPA are too optimistic. There are generally two reasons for this (PwC, 2016); budgets were unrealistic, because digital labour's cost drivers were not addressed adequately, and the value from digital labour is created, when applying it consistently and based on a strategy, not by rushing into technological implementations without a broader perspective.

Not meeting the expectations can lead to distrust in the technology among senior executives, even if the savings would be good. The general ratio for full-time equivalent (FTE) per robot is 2-2,5, depending on scale. (PwC, 2016)

Comparing the ROI of software development or implementation and RPA can be difficult. Essentially, RPA uses the same software as a human would, although it usually is not restricted to the user interface (UI) view. However, there are instances, where a process

could be done by coding a software robot to utilize existing systems or by having a system update or integration to help with the process. (PwC, 2016)

All cases are different, so there is no simple answer to which is the best approach in a specific situation. It depends on the importance and frequency of the process, and the potential costs of implementing and maintaining the robot or the software update or integration. Software development is usually more expensive, but cheaper to maintain and more reliable. As a rule of thumb, the more important and frequent the process, the more suitable software development is versus RPA. (PwC, 2016)

The simplest way to calculate the ROI of an RPA implementation project is (Digital Workforce, 2020):

Cost of RPA Automation – Hours Spent on Performing the Process Manually * Cost of Manual Labour

Pay-back time of an RPA project is typically around 3 to 9 months, depending on the complexity of the project and the chosen approach, whether it is a bought service model or if the organisation has licensed the technology and coded the robots themselves. For the first projects, service model approach can be cheaper, but it gets more and more affordable to code the robots yourself, when RPA automated processes increase. (Digital Workforce, 2020)

To get the full picture of actual outcomes of an RPA project, all quantitative outcomes should be considered (ElectroNeek, 2020):

- Cost-saving

Robot's time is usually much more invaluable than human workers. Though, it largely depends on the usage rate of the robot and the time it takes for a robot to perform a task versus a human.

- Time

Robots can process data and perform tasks much faster than humans, so the processing time of automatized processes can reduce in a major way.

- Accuracy

Human errors are eliminated with RPA, not including possible errors in the coding of the robot.

- Longevity and flexibility

The processes execution rates are easily adjustable and a robot can work any time of the day.

- Speed of Implementation

In addition to quantitative outcomes, RPA projects have qualitative outcomes. These include service quality and customer satisfaction, reduction of human errors, employee morale, business agility and elimination of downtime risks. (ElectroNeek, 2020)

It takes more effort to calculate the qualitative outcomes, but it can and should be done. It depends heavily on the nature of the automated process, where the biggest benefits lie. That is why it is important to look at all the aspects, when calculating the ROI of RPA. (Willcocks, 2017)

One possible formula on how to calculate the ROI of RPA is (ElectroNeek, 2020):

ROI = [(VTG*AG + Benefits from process acceleration + Benefits from fewer errors) – AC]/AC x 100 %

VTG means Value of Time Gains. Essentially it determines the difference between the costs of processes executed by humans and the costs of processes executed by robots. Sometimes this calculation is understood to be the ROI of RPA, but it is only a part of it. (ElectroNeek, 2020)

Calculation of VTG is (ElectroNeek, 2020):

VTG = (EC – AC)/AC x 100 %

EC means the costs of processes executed by humans. AC means the costs of processes executed by robots. It should be noted, that the cost of human hours is not only based on salaries and social expenses. There are also indirect costs, such as office rents, workspace and training. Such is the case for robots as well, since their cost is not only the license-fee, but also, in example, a virtual workspace, maintenance costs and IT-related costs. (ElectroNeek, 2020)

In addition, FTE, Full-Time Equivalent, should be determined for the process for a human and a robot, since it is likely, that they do not work on the same repetitive task all the time. Hence, the formula for the costs of processes executed by humans and robots is such (ElectroNeek, 2020):

Employee/RPA related costs (direct + indirect expenses) x FTE coefficient = EC/AC

There are also two other concepts, beside the aforementioned ones, in the ROI formula: Benefits from process acceleration and Benefits from fewer errors. Robot can increase the processing speed and frequency of the process, so it can be performed in a more efficient way. Also, robot does not make human errors, which might have a huge effect on process efficiency and costs. (ElectroNeek, 2020)

## 3.4 RPA in the finance department

Automation and software robotics is drastically changing the way accounting professionals are working. At first glance, the thought of automation in the finance department might sound scary for an accountant, who is fearful for losing his or her job. However, automation in the finance department is nothing new, RPA is just another adaptation of it. Because of RPA and other methods of automation, accountants will spend less time combing through spreadsheets and more time analysing, anticipating and communicating. (Peccarelli, 2016)

An important aspect of RPA in the finance department is that a robotized process has a clear audit trail and all of its steps are documented. Every deviation is documented. This makes

the job of an auditor easier, but also makes the robot a reliable operator to ensure that laws and regulations are followed. (Efima, 2017)

Especially in large organisations, finance department deals with huge amounts of data, which is why RPA is a popularly used automation method. Robots are most commonly used for three different kinds of tasks in the finance department (Efima, 2017):

- Regular and rule-based processes

The processes have large volumes, stable processes and structured data. In example, billing batch job and checking purchase invoice basic data.

- Comparing data between IT systems

In case integrations between the systems do not make fiscal sense or are not possible to build. In example, retrieving data from emails and excels, and transferring them to different systems.

- Checking or modifying massive amounts of data

In example, checking regularly that vendor data is up to date or updating user data in an organisational transition.

Common applications of RPA in the finance department are described in Figure 8 and Figure 9.

| Department | Task |
|---|---|
| Billing | Creating products with the data of another system or file |
| Billing | Inputting invoice data from a billing request |
| Billing | Transferring billing data from another system |
| Billing | Reconcialiation of billing interfaces |
| Billing | Billing batch jobs |
| | |
| Accounts receivable | Establishing customers |
| Accounts receivable | Updating customers e-invoice addresses |
| Accounts receivable | Updating customers credit statuses |
| Accounts receivable | Matching invoice and credit notes |
| Accounts receivable | Matching payments to invoices |
| Accounts receivable | Credit control batch jobs |
| Accounts receivable | Sending reminders by email |
| Accounts receivable | Adding a sales hold to customers with a negative credit rating |
| | |
| Travel expenses | Approving invoices |
| Travel expenses | Returning an invoice, if its missing receipts |
| Travel expenses | Updating personnel data |
| Travel expenses | Updating personnel data from an email request |
| Travel expenses | Approving travel expenses |
| Travel expenses | Approving mileage allowances |
| Travel expenses | Approving reimbursements of costs |
| Travel expenses | Updating dimension values from the bookkeeping system |
| Travel expenses | Updating projects from the project management system |
| Travel expenses | Creating re-invoicing payment journal |
| Travel expenses | Payment run |
| Travel expenses | Transfer to bookkeeping |

Figure 8. Processes in the finance department, where RPA is commonly used. (Efima, 2017)

| Department | Task |
|---|---|
| Accounts payable | Creating new vendors |
| Accounts payable | Checking preliminary tax withholding register and VAT register statuses |
| Accounts payable | Checking invoice basic data |
| Accounts payable | Finding the order number from the invoice data |
| Accounts payable | Correcting or deleting incorrect order numbers |
| Accounts payable | Selecting the invoice type |
| Accounts payable | Filling in dimensios to invoices |
| Accounts payable | Selecting approvers |
| Accounts payable | Sending invoices to approvers |
| Accounts payable | Transferring invoices to Acccounts payable |
| Accounts payable | Matching invoices and credit notes |
| Accounts payable | Creating payment files |
| | |
| Payments | Inputting manual payments from i.e. excels |
| Payments | Creation and transfer of payment journals |
| Payments | Recognizing incorrect payments |
| | |
| Bookkeeping | Bookkeeping interface batch jobs and reconciliations |
| Bookkeeping | Other reconciliations |
| Bookkeeping | Importing and posting excel vouchers |
| Bookkeeping | Updating the chart of accounts and other dimensios to other systems |
| Bookkeeping | Transferring and reconciling data to the Group consolidation system |

Figure 9. Processes in the finance department, where RPA is commonly used. (Efima, 2017)

Most of the examples in Figures 10 and 11 are ones, where human input is still needed to some extent. Even though the process itself would not need human interference, checking, what the robot has done should be done by a human. Of course, the check can also be helped by the robot by, in example, creating lists and logs of its activities or creating a simple excel of the process outputs for the human to go through. (Efima, 2017)

Robots are coded by humans, so human errors can still be found in the robot's code, and the IT environments the robot utilizes are experiencing updates and changes, which might confuse the robot. There is not much room for errors in the finance department, so robot supervision is mandatory. (Efima, 2017)

However, if an organisation is able to automize at least some of the processes in Figures 10 and 11, the time-savings can be vast. (Efima, 2017)

# 4 Process development

Performance improvement, or human performance improvement, is both the process of improving performance and the positive result of the performance improvement process. The outcome of making the performance better is performance improvement. By measuring and defining the starting point and finishing with a better outcome equals to performance improvement. (Van Tiem, Moseley & Dessinger, 2012)

Process mapping, and the tools and techniques to develop processes, are introduced in chapters 4.1 and 4.2.

## 4.1 Process mapping

Process mapping, also known as PMapping, is widely regarded as being a core approach in facilitating organisational improvement. It is used widely in the manufacturing industry, as well as laboratories, food production, construction and service environments. There are multiple variations, but the basic idea behind all is to gain a comprehensive understanding of the current process by portraying the process in a visual way. (White & Cicmil, 2016)

The idea of process mapping is to capture and record how a certain input, in example an order or a form, is processed. In other words, how it is converted into a final output. To do this, the flow of the product and information is traced from beginning to the end. In the case of providing a service, all activities in creating the service are documented. (Tuominen, 2016b)

In practice, a process map, or a flowchart, is a diagrammatic representation of a sequence of actions for a specific activity. It helps the viewer to understand all steps of a given process and the prerequirements of specific tasks. Different shapes and colours represent different steps of the process. (Yael & Chen, 2017)

Human brain can register graphical examples faster than oral or written ones. If sub-processes and tasks are only described in written format, let alone oral, it is difficult to tie the processes together, especially if there are a lot of sub-processes. In a process map, it is easy to see, what is the starting and ending point of a process, which makes it simpler to understand the causality of different processes and tasks. (Yael & Chen, 2017)

Understanding the process and its steps makes it easier to recognize the vulnerabilities and limitations of the current process. These can include, in example, wait times, inefficient hand-offs, double work or unnecessarily complex workflow. Process mapping the process makes it easier to understand and therefore improve. (Yael & Chen, 2017)

An example of a process map is depicted Figure 10.

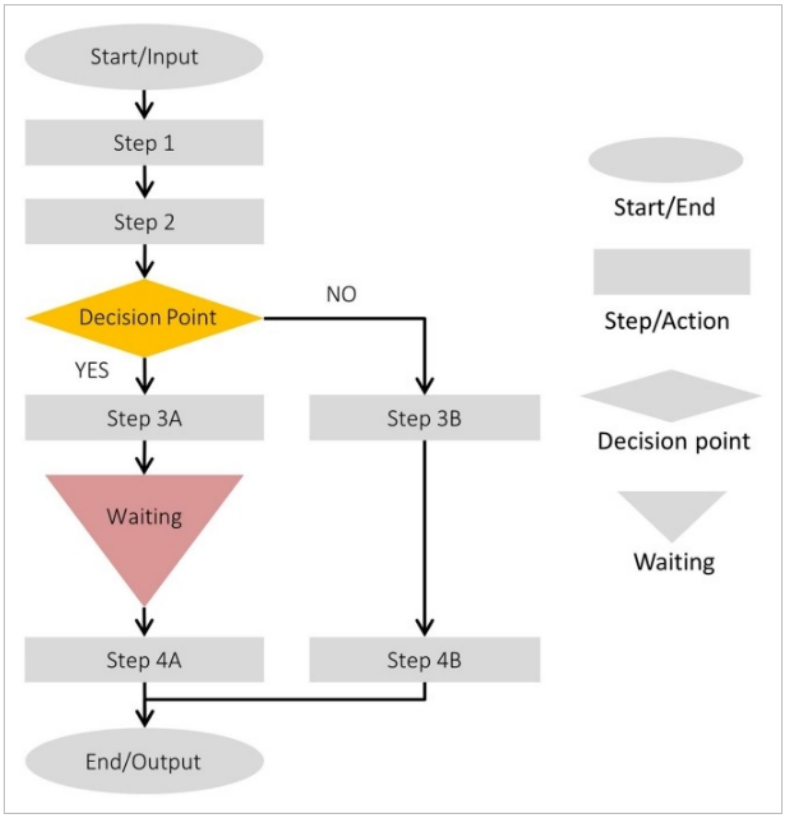


Figure 10. Process map template. (Yael & Chen, 2017)

It can be difficult to understand processes, which have steps taking place in different functions of an organisation, especially in a large organisation. Departments in an organisation do not function as separate entities as all require or receive some kind of input from one another. Both, the independent and interdependent steps of the process have to be reflected, to accurately represent this kind of a process. These types of process maps are called cross-functional process maps. (Tuominen, 2016b)

## 4.2 Process development tools and techniques

Process development can be regular and scheduled support and development for an existing process or it can be major changes to an existing process due to problems arising in the process. (Van Tiem, Moseley & Dessinger, 2012) Another term for regular and scheduled process development is continuous improvement.

In order for an organisation to be able to practise one of the continuous improvement methods, it has to adopt the six principles of continuous improvement (Millard, 2018):

1. Improvements are not necessarily major strategic shifts or new inventions, but actually in most of the cases they are based on small changes

2. The ideas of employees are valuable

3. The ideas, that prove to be the most valuable in the long run, are typically inexpensive to execute

4. Employees take ownership and are involved in the project and in continuous improvement

5. Feedback is important in all stages of the improvement project

6. Improvement can be measured and potentially repeated

There are numerous ways of adapting continuous improvement culture in to the organisation. These methods include: Lean, Six Sigma, Value stream mapping, The 5 Whys and the PCDA Cycle (Plan-Do-Check-Act). This report focuses on these methods, because they are important and widely used, and they were the most relevant in regards of the empirical part of the thesis.

Lean has been known with many names in the past. Most people consider the Toyota Production System (TPS) as the first adaption of lean principles. It was conceived by Toyota and was implemented by them between 1948 and 1975. In the 1970s it was popularized in the western world. (Plenert, 2011)

Lean can be described as: “Leas is a focus on the elimination of anything not required in the delivery of a quality product or service, on time, at lowest costs, to customers.”. (Plenert, 2011)

A good example of lean thinking is the “batch” perspective. Especially in manufacturing, but also in service, IT and many other fields, a dominant thinking model has been to batch several orders or pieces of work, which are in the same stage of production or handling. In example, if an employee creates a batch of ten orders and then starts working on them,

waste is generated, when nine orders are waiting to be processed, when the employee is working on one. Instead, in the lean mindset, order should be processed right away without batching to minimize waste of time. (Plenert, 2011)

Six Sigma is a tool based on eliminating variation. It has a scientific background, where the errors of a process must be measurable, so they can be identified and fixed. (Quality Knowhow Karjalainen Oy, n.d.)

A great example, and one of the first large companies to adapt Six Sigma in all levels of their organisations, is General Electric, under the reign of Jack Welch in the 1990s. Adaption of Six Sigma requires a lot of training for the key people of the organisation. (Byrne, 2003)

One of the key elements of Six Sigma is to move away from the on average thinking to measuring variation. In example, if a customer sometimes receives the order ten days before the agreed upon delivery and sometimes ten days after, the variation is too large, even though the average delivery time might be on a good level. This has a major effect on the customers processes as they can except the order to arrive on the exact agreed upon time by eliminating variation of the process. (Byrne, 2003)

Value stream mapping is a variation of lean thinking. The basic idea of it is to map the process as closely and correctly as possible using visual aids (whiteboard, value stream mapping software), designing the board to catch possible areas of improvement and addressing the common problems in the process. In most cases, the method will reveal hidden bottlenecks involving unnecessary waiting time or work. (Planview Leankit, n.d.)

The 5 Whys is a method designed to locate the root cause of a problem. It is quite easy to implement as it only requires addressing the problem and then asking why until the root cause is revealed. Usually after a few questions the answers will be absurd, which means the root cause can be found from the previous answers. (Planview Leankit, n.d.)

The PCDA Cycle is a commonly used method of implementing changes to a process. It starts with identifying an opportunity and planning for change (Plan). The change is then implemented to a part of the process (Do). The results of the change are analysed and conclusions are made, whether the changes had the desired effect (Check). If the results

were good, the change is implemented to the whole process (Act). Continuous evaluation of the process after implementation is a key part of the method. (Planview Leankit, n.d.)

Continuous improvement and RPA are not mutually exclusive. The methods of continuous improvement are usually fine tools in understanding and analysing the current state of things, identifying improvement opportunities for the future and defining a road-map on how to get there. RPA can work as a way of achieving those goals and tracking the results. For RPA, it does not matter, which method of continuous improvement an organisation utilizes; it can be of help in all of the methods. (Os, 2015)

# 5 Empirical part of the thesis

In the empirical part of the thesis the RPA model of Company X Oy is described. Also, the implementation process depicted. As the company is in early stages of its RPA journey, the desired state of the model and the implementation process are described. Company X Oy's finance organisation and its departments are depicted. Chapter also includes ideas for next RPA projects in the Company X Oy's finance department and an RPA plan for the finance department.

The recent RPA implementation process and its challenges in the case company are described. Information for this is mainly gathered through observational methods, but also case company's internal material is utilized. The ideas of processes to be automated with RPA next have been gathered from workshops, employee interviews and authors own experience.

The first implemented processes with RPA were in the finance department and most ideas for the processes to be implemented were from there as well, since the project originated from the finance department. Authors own background is also in finance, so the processes there are familiar to him. In the near future, processes outside of the finance department are planned to be reviewed for possibilities for automatization with RPA.

The conclusions and the tested ideas for the next processes to be implemented with RPA are presented at the end of this thesis. The result will also include a guideline for reviewing

possible RPA automatization processes as well a guideline for approaching these processes. The case company will benefit from the results, when continuing the RPA project.

## 5.1 Company X Oy RPA model

Currently, Company X Oy has not described its RPA model. This is mainly due to the fact, that only a handful of people are involved in RPA development, not including process owners, so the RPA project process, guidelines, instructions, tasks, responsibilities, roles and approaches have been clear to the small group of people involved in the projects. Also, because of major IT and other projects in the organisation, RPA model and development have not been a priority.

However, once RPA development is put on the front burner and more people will inevitably be involved in the projects, it is important, that the company has an RPA model in written form. At minimum, this should include practical instructions for different situations and the structure of the RPA team and the individual roles in it.

### 5.1.1 Company X Oy RPA Strategy

As with RPA model, the company does not have a written RPA strategy. Strategy should also be described once the focus is turned more to RPA development.

One of the core values and keys to Company X Oy's success has been the company's agility and low over-head costs. This was the main driver for initiating RPA development in the first place. Retail business is transaction heavy, which makes it a prime target for RPA development. The company is always looking for ways to develop its ways of working. Analytics and artificial intelligence are already being utilized in the company.

### 5.1.2 Company X Oy RPA solution

Company X Oy has chosen UiPath as their RPA software. They have a couple of developer licenses and a few people have studied coding with the robot with UiPath, but the processes now in production and in development have been coded by external consultants. The RPA

partner also maintains the technical environment, where the robots are operating. RPA support and updates are the RPA partners responsibility as well.

As there is no RPA support staff inside the company, process owners and people involved in the automatized process are responsible for executing business analysis and giving details about backlog and support issues to the RPA partner. They also own the automatized process.

As of now, Company X Oy only employs a single robot. Because of this, there is no need for an operator for the robots to distribute work between the robots and schedule them. In all likelihood, a second robot will be needed in the near future, which stems the need for an operator as well. The operator services will be bought from the RPA partner. In the near future, the operator services might be done in-house, depending on available resources and competencies.

### 5.1.3 Company X Oy RPA roles and responsibilities

Process owners are the persons responsible for the automated processes. They have good knowledge on how the process has been before automation, what are the risks, from where the necessary data is gathered, et cetera. Because they are so involved in the process and are used to it, it might, in some cases, be difficult for them to see the automation possibilities, and what the process might look like after RPA implementation.

In the RPA implementation project, process owners are responsible for the run-down of the old process and make sure, that the persons involved in the process know their role and tasks in the new process. After RPA implementation, the process owners are responsible for monitoring the robot and reporting issues to RPA support.

RPA development team is searching for new processes for the RPA, makes ROI calculations, gives trainings and workshops to personnel about RPA, makes decisions, whether a certain process is viable for RPA and is involved in RPA implementation projects. They communicate with IT to avoid overlaps and needless double work. They are also in close contact with the process owners about the functionality of the robot, so there are no major problems.

RPA business owner makes the final decision on RPA implementation projects and is the one responsible for RPA in the Group Management Team.

As mentioned in the chapter before, the coding of RPA is done using an outside supplier. In the near future, it is planned to reconsider this and possibly bring the coding in-house. Should this happen, it would create new roles in the company related to RPA, such as RPA developer and RPA operator.

## 5.2 Company X Oy RPA implementation process

Because Company X Oy is in the beginning of its RPA journey, the implementation process, like other RPA related processes, is not yet regularized. However, there are elements already, which take place in all RPA considerations. These are:

- Idea for RPA automatization
- Evaluating the process in regards to RPA possibilities and limitations
- Business case evaluation
- Process walkthrough
- Development
- Go-live
- Support and updates

Ideas have been gathered in workshops. Workshops have been also trainings, where the participants have been presented the concept of RPA, its possibilities and limitations, and its common applications in the finance department. After the training, the participants have had a change to think about ideas for RPA from their own work. These ideas were then discussed among the group and the best documented were for further development.

In the future, it might be a good idea to gather ideas in other ways as well to make sure the best ideas are available. Maybe a standardized document or Google Form, available in the company's Intranet, would be viable option.

Evaluating the process in regards to RPA possibilities and limitations already starts in the workshop, where the initial ideas are discussed and the best ones documented. It continues in a smaller group, where the needed systems, schedule and overall requirements are discussed in light of what a software robot is able to do. In example, if a process has to be started in a very specific time, there is little time to do it or the process cannot fail or the business process would suffer too much, it has to considered very carefully, whether or not the process should be left for a robot.

An important part of the business case evaluation is the ROI calculation. All possible effects are discussed and documented, and compared to the estimated cost of automating the process with RPA. Other factors, such as current IT updates and possible changes to the business process are also considered.

A very detailed process walkthrough is done with the RPA partner, while questioning each step of the process to make sure, there is no unnecessary tasks, or the process or task could be done in another, more efficient way.

Coding of RPA processes is now done by the RPA partner, but the process owner, or owners, and the RPA development team are heavily involved in the testing of the process with the RPA partner. Numerous tests for all possible scenarios have to be performed to minimize the risk of the robot facing a situation it does not know after go-live. Fail-safes have to be coded for all tasks of the process, so the robot knows, how to end the process or move to another phase, if something goes wrong. Without fail-safes, robots could land in loops, where they try to perform a task, but face a problem they are not equipped to handle and try to perform the task infinite times always running into the same issue and starting over.

Go-live decision is made and it is scheduled after successful tests and the process is approved by Company X Oy. RPA partner supports heavily right after go-live to make sure there is no issues with the robot. Also, the people, who previously did the tasks, are making sure, that the outputs are correct. Support continues after go-live. The robot has to always

be considered, when there are changes to the IT infrastructure or IT updates, so IT has to be well aware of the robot and what systems or views it is using.

### 5.2.1 Lessons from the first implementation projects

The importance of process walkthrough and evaluating, and also criticizing, the process between the process owner, and the people doing the process, RPA development team and the RPA partner cannot be overemphasized. By doing this step of the implementation process well and with time, many issues, which otherwise would be coming up after go-live, can be prevented. Also, because people are doing these tasks, it is more than likely, that there are differences between ways of working. So, the definitive final process has to also be determined before development of RPA.

Part of one RPA automated process involves the robot performing tasks in a remote desktop. This has proven to be significantly more difficult to code for the robot than a non-remote environment. If the processes done in a remote desktop are complicated, it is likely, that it does not make sense to implement for RPA.

RPA automated processes mostly use an ERP system, which sees frequent updates. It is vital, that there is an understanding in the IT about the robot and the views it uses, so they can inform RPA development in an early stage. With a clear understanding on both ends, it is also possible to update the system to accommodate the robot in a better way.

Some of the RPA automated processes utilize one system, which is operated by a third party. At least for this system, it has meant, that there might be changes overnight without a prewarning. This crashes the robot, since it inevitable encounters views, which it does not understand. The development of a robot to use a system like this can also be more difficult than for other systems, because there might not be a test environment. So that stage of the process might be just a few try's in before go-live. Also, the user rights for a robot user might be more difficult to obtain.

The first processes implemented were very simple ones. They were relatively easy to code for the robot, since they were not overly complicated. The relative success of the first processes has sparked RPA ideas, which are much more complicated and difficult to even

document. Deliberation should be used in regards to the complexity of the process, whether it makes sense to code the process for the robot.

If the robot is not told to create excels for humans to interpret about its activities or send email notifications, when necessary, it can be difficult to know, what the robot is actually doing or if it is doing the right things. One of the RPA automated processes involved a task, where one wrong click might be worth thousands of euros, if done incorrectly. Yet, the task is done hundreds of times a day. So, it is worth the effort to build up follow-ups for the robot to check its activities. Also, it should be considered, how the notifications, excel sheets, et cetera should be communicated to human employees, so they are most likely to be noticed.

When using an RPA partner, it is important to realize, that they do not have a full understanding of the process, the business processes, IT systems, the organisation or other company specific matters. Everything has to be very clearly explained and specified to them to avoid misunderstandings. It is also important to somewhat understand the robots code, even though it has been done by an RPA partner.

## 5.3 Company X Oy finance organisation

The finance organisation in Company X Oy consists of 20 to 25 employees, depending on how inter-interdepartmental boundaries have been set and how many part-time workers are needed at any given time.

The field, in which Company X Oy operates in, is considered a quite difficult one for automating processes and tasks in the finance department. The pace is fast in a retail sale organisation, there is a vast number of variations for selling, and purchasing, the same type of product, there are many stakeholders involved in a single transaction and very close interaction and compliance is needed with several government organisations and applications. Also, there are quite a few field specific tax regulations, which the organisation has to follow.

Due to these reasons, the finance organisation and specifically the tasks of each department are not traditional and the same job title can mean very different tasks in Company X Oy

than in most other companies. Some tasks in the departments have been left out in order to retain the anonymity of Company X Oy. However, the fundamental purpose of each department is still the same (accounts receivable manages receivables, accounts payable manages payables, payroll manages salaries, et cetera).

The thesis focuses on finance departments, which are more susceptible to benefit from RPA, according to workshops and interviews within the company, as well the authors own perception. Therefore, financial controlling services, in example, have been excluded from the study.

### 5.3.1 Accounting

The accounting functions main responsibility is to manage the monthly, quarterly and annual closings. The IT infrastructure of Company X Oy has been built in a way, that almost all standard purchase and sale transactions are automatically posted to the ledger without finance intervention. When it comes to the validity of the accounting, a lot is depended on the IT systems and the interfaces between them, which generates the need for trustworthy interface control and reconciliation. Also, if the systems are used incorrectly against the accounting departments instructions, incorrect postings will be made automatically, which require manual corrections.

The main tasks of the accounting department are:

- Processing of recurring entries, such as inventory change calculation and booking, booking of other profits and accruals

- Reconciliations of sub-ledgers and balance sheet accounts

- Correcting and instructing other departments on the usage of the systems to maintain the validity of the accounting

- Financial statements and statutory reports

- VAT reporting

Even though, most transactions are posted automatically to the ledger without manual tasks required from the accounting department, there are many tasks, which require manual calculation and posting. These are either too complicated or expensive to automate in the systems or in the interfaces, and because of this they are possible candidates for RPA automation.

Different reconciliations take up most of the time in closing of a period in the accounting department. All sub-ledgers have to be reconciled, as well all balance sheet accounts. Here might also lie possibilities for RPA automation.

Because there is no accounting intervention before posting most purchases and sales, sellers and purchasers could be considered as sort-of accountants as well. That is why it is so important, that the systems and interfaces have been built in a way, that mistakes are prevented. And, because of the volume of different variations and development of new ways of creating sales, the accounting department has to involved in the development of the IT systems and instruct others to use the systems in the correct way.

Accounting department is also responsible for VAT reporting to the tax authorities, as well as financial statements and statutory reports in co-operation with controlling services.

### 5.3.2 Accounts payable

Company X Oy's field is quite transaction-heavy, which includes purchase invoices as well, so there is a lot of invoices to be handled. As of now, Company X Oy does not have a purchase order system in place, which means, that there are no orders to match with the invoices, so each invoice has to be processed manually. However, there are some contracts in place to which invoices can be matched to and are then faster to process.

The main tasks of the accounts payable department are:

- Processing invoices, when they arrive, including:
    - Checking invoice basic data

    - Selecting the ledger account/-s, other ledger dimensions and VAT codes
    - Selecting the reviewers and approvers
- Maintaining vendor master data
- Invoice circulation control
- Posting approved invoices to the ledger
- Creating payment journals

The most time-consuming task of the accounts payable function is processing invoices. Also, in Company X Oy, accounts payable department is responsible for selecting the ledger account and dimensions to the invoice rather than the reviewer, which is different than most companies. It has been viewed as the most viable choice considering the validity of the accounting and the time restraints of the reviewers.

There are some IT initiatives in progress to make this process less manual, such as AI. It can be quite difficult to teach RPA these steps, since there are so many rules in selecting the accounts, dimensions, reviewers and approvers, but also because it would require RPA to comprehend invoice data from invoices pictures, even though e-invoices also deliver invoice data in a more easily processed form.

The organisation has to be very careful with vendor master data, because of risk of fraud. There are internal controls in place, where the changes in the data are controlled, but they take up time and are prone to mistakes, since people are doing them and there are so many changes to check. Also, invoice data is in a different system than vendor master data, so there is a delay, when doing changes to vendor data. This might be a considerable candidate for RPA automation.

Late fees and late payment interests are sometimes the result of receiving the invoice too late and sometimes they are the result of reviewing or approving the invoice too late. This issue is costing the organisation money, which could easily be saved. RPA could be used to

help with this issue as well by, in example, going through the invoices in circulation and creating reminder emails. It could also create data of the reviewers or approvers usually at fault, so the issue could be tackled in a more direct way.

Posting invoices from another system to the ledger and creating payment journals of them are relatively simple, but also critically important tasks. A very specific timetable is set for the payments, which has to be kept. If there are issues, they have to be addressed quickly. For these reasons, if these processes are to be automated with RPA, reliable backups and error messages have to be set up.

### 5.3.3 Accounts receivable

Accounts receivable department is the most field-specific department in the Company X Oy finance department. Other than very special cases, where the IT systems are not able to create certain kind of invoices, the accounts receivable department does not create invoices to customers. Their main duty is to oversee the receivables of sales and make sure all payments are received.

The work between the people in the department is divided by the stores they handle and the bank account each person handles. Each accounts receivables clerk has their “own” stores and a bank account to which his or her stores payments come to.

The main tasks in accounts receivable department are:

- Process and post the bank statement
    - Including the processing and posting of the payment reference file
- Matching payments to receivables, which are not automatically reconciled
- Controlling the receivables by store
    - Informing and checking up on the stores about open receivables

    - Creating payment reminders
    - Transferring overdue receivables to external collection company's system
    - Evaluating overdue receivables, if they should be booked to credit losses

- Creating manual payments

Almost all incoming payments are received with a payment reference, so they are automatically matched to the correct open receivable with the payment reference file. Outgoing manual payments are posted to the correct ledger account and dimensions, when the payments are created, so they are already booked, when posting the bank statement. There are not many lines on the bank statement, which have to be manually posted on the statement. Also, the statement and payment reference have to be booked first thing in the morning to have an up-to-date view of open receivables. Therefore, a software robot might be able to do this before accounts receivable clerks start working.

The incoming payments, that do not have a payments reference, have to be manually matched to the correct receivable. This is time-consuming task and it could be avoided, if all incoming payments would be paid with a payment reference. Also, if the reference is missing, the accounts receivable clerk, or a software robot, can add the correct reference to the payment, when processing the bank statement and match the payment automatically.

The most time-consuming task for accounts receivable clerks is the controlling of open receivables. Clarifying the reasons of delays of payments with the stores and other stakeholders, navigating and seeking information from companies own IT systems, but also from other stakeholder's systems and sending lists of open overdue receivables to management and other persons interest take up most of the day for accounts receivable clerks. A lot of this work is depended on human interpretation and it is not rule-based, so it is difficult to automate with RPA. However, IT systems, interfaces and selling processes are being reconsidered in hopes of finding a more viable process for handling open receivables and reducing their volume.

The payment requests for manual payments do not have a fixed format and are often sent accounts receivable clerks by email in an informal form. It is difficult for a software robot to comprehend. It would require a change in the process to automate the manual payments by creating a fixed form for manual payment requests.

### 5.3.4 Payroll

Nature of the field in which Company X Oy operates in means, that there are many different salary models to follow. There are several different provision-based salary models, short- and long-term bonuses, hourly wages, monthly wages, fringe benefits, other remunerations and tax-free compensations. Of course, payroll department is not responsible for calculating all of these amounts, for some, they get only the final figures, but it still a lot to take into consideration.

The main tasks of the payroll department are:

- Collecting and calculating the salaries of different salary models
- Reimbursements of expenses
- Income register (Tulorekisteri) declarations
- Processing different declarations to authorities

The calculation of salaries is mostly comprising of gathering data from several different sources and inputting that data, manually or with an export file, into the payroll system. A single salary item does not take long to process, but there are many salary items and a lot of employees. Some salary items also require more manual work than others. There could be opportunities to automize with RPA in the process of gathering payroll data from various places. Though, in almost all cases, it would take a change in the process as well to generate more structured data for the robot.

The most time-consuming task is processing the hourly wages. A lot of time has been saved in the process by making the form for reporting the hours worked more structured, so time

would not be wasted on searching the report for information. However, the report is a lot of times filled out by hand, so it can be hard to read or to process by a software robot and reports are missing, so the payroll process is delayed. The optimal solution for the problems mentioned is a system, where the employees can input their working hours, supervisors can approve them and the data is automatically imported to the payroll system via integration between the systems.

The pace is fast in Company X Oy and oftentimes it means hasty smaller acquisitions to accommodate a customer or to solve an issue. This means a relatively high number of reimbursements for the employees in exchange for the receipt and the approval of a supervisor. There is an IT system in which the reimbursements could be handled, but it has been seen as too much work for the employees to learn a new system, when they usually only need reimbursements maybe a few times a year. There is also no structured request for a reimbursement, so it would quite difficult for a software robot to handle.

All paid salaries and other compensations have to reported to the Income register (Tulorekisteri) by the payroll department. There is an integration between the payroll system and the Income register, so the salary items are automatically transferred. But there are exceptions, where the import does not work and the Income register has to be manually corrected. Therefore, the reconciliation between the payroll system and the Income register is mandatory. This might be an area, where RPA could be of use.

Even though the Income register has made it simpler for the payroll in terms of government declarations, since almost all government organisations get the employee income data they require from there, there are still some other declarations and reconciliations to be made alongside with the Income register. Also, payments to different stakeholders, such as trade unions, distraints and tax authorities have to be made within a specific period from the payday. These have automatic functions in the payroll system and require relatively little working time, so they are not prime candidates for RPA automatization.

## 5.4 RPA ideas for the finance department

Automation in the systems and in the integrations between different systems are used widely in Company X Oy. Each time an issue or a new development arises, it is evaluated, how it is best handled. Oftentimes, the best results could be had with system development, but it is also usually the most expensive option. If the manual workload is not too great, it can be decided, that the issue will be handled manually. Company X Oy has found, that the most valuable areas for RPA can usually be found from the processes between the two; the process is too expensive to tackled with system development, but it creates too much work to be handled manually.

Company X Oy held a workshop for the accounting and accounts payable departments to collect ideas for RPA development. The workshop was held on 24th of September 2020 and it was participated by 10 people. Before the actual idea workshop, there was an introduction of RPA to the participants, as well as user experiences from a different department within the company, which has been using a software robot to help with manual processes for over a year. In the workshop, the participants were partnered up and given time to think possible processes for RPA automation, and then presenting their ideas, which were discussed among the whole group.

Ideas from the workshop are depicted in Figure 11. Also included are other ideas from the accounts receivable and payroll departments, which are based on authors own experience working in or with the department and interviews with people in those departments. The ideas presented are evaluated in chapter 5.4.1.

| Department | Task | Description | Benefits |
|---|---|---|---|
| Accounting | Sub-ledger reconciliations | Reconciliations between ledger bookings and sub-ledgers, such as ERP and payroll systems | Quality, time |
| Accounting | Balance sheet reconciliations | Matching related transactions and creating lists of open transactions per ledger account | Quality, time |
| Accounting | Reconciliation of clearing and bank account ledger accounts | Checking daily that the clearing accounts match and the bank accounts match between accounting and bank | Time |
| Accounting | Uploading documents to bank statements | Transferring documents from the archiving system to the bank statement | Time |
| Accounting | Deal data search from another system | Searching deal related data from another company's system and using it to match payments to receivables | Time |
| Accounting | Group accounting reconciliation | Transfer and reconciliation of company ledger transactions to Group accounting | Time |
| Accounting | Printing receipts | Receiving credit card receipts by email and printing them | Time |
| Accounts payable | Routing of purchase invoices | Selecting the ledger account, dimensios, the VAT code and the approver and the reviewer to new | Quality, time |
| Accounts payable | Changes to vendor data | Processing changes to vendor data or checking the changes made by humans | Quality, time |
| Accounts payable | Invoice circulation control | Going through invoices in circulation, separating invoices with delays on an approver and acting upon them | Quality |
| Accounts payable | Posting invoices to accounting | Going through approved invoices, transferring them to accounting and | Time |

| | | | |
|---|---|---|---|
| Accounts payable | Processing contract invoices | Matching invoices related to contracts to correct contracts | Time |
| Accounts receivable | Process bank statement and payment references | Posting empty ledger lines on the statement, transferring and booking the statement to accounting, and transferring and booking the payment reference file | Time |
| Accounts receivable | Process missing payment references | Going through the lines with missing payment references and retrieving the correct references from the ERP system | Time |
| Accounts receivable | Receivable control | Reviewing open receivables, retrieving data from other systems related to the receivable, creating lists and delivering the lists to accounts receivable clerks | Quality, time |
| Accounts receivable | Manual payments | Processing manual payment requests and creating a new manual payment for a human to approve | Time |
| Payroll | Compiling payroll data | Gathering payroll data from different sources and systems, uploading them to the payroll system and reconciling the upload | Time |
| Payroll | Reimbursements | Processing a received reimbursement claim, flagging possible errors and creating a payment for a human to approve | Time |
| Payroll | Income register reconciliation | Reconciliating the data of the payroll system and the Income register, and compiling a list of differences | Quality, time |

Figure 11. RPA ideas for Company X Oy finance department.

### 5.4.1 Evaluation of RPA ideas

The ideas presented in the workshop were further discussed in separate workshops between each department. For the accounts payable department, the team leader and one accounts payable clerk took part, as well as the author. For the accounting department, two accountants and the author participated.

In the workshops, the ideas from the first workshop were listed and categorized. The ideas were then discussed and evaluated. It was agreed that the most important thing to take into consideration was the complexity of the process, because the desire was to achieve easy wins and not get tangled up in a too complex project, which takes too long or is even too difficult to complete. This was considered a crucial factor, especially for the first projects to approached with RPA in specific departments. Employees would see the benefits of RPA faster, which would generate new ideas and trust in RPA.

The criteria used to evaluate the processes were:

- The complexity of the process
- Inputs and outputs
- Possible time savings
- Other possible benefits
- Systems involved

Process complexity was approached by first describing the process and listing possible roadblocks, decisions and potential possibilities. Then it was discussed, how a software robot could overcome the roadblocks, make the necessary decisions or select the correct alternative in all possible scenarios. Few processes had to be eliminated in this stage, because there were too many possibilities for the process to play out to make the robot

perform reliably and without humans constantly having to interfere. The processes were also the ones, where the benefits were considered the greatest, so they should be reviewed for other potential solutions to help with the processes.

The processes eliminated in this stage are described in Figure 12.

| | | | |
|---|---|---|---|
| Accounting | Balance sheet reconciliations | Matching related transactions and creating lists of open transactions per ledger account | Quality, time |
| Accounts payable | Routing of purchase invoices | Selecting the ledger account, dimensios, the VAT code and the approver and the reviewer to new | Quality, time |
| Accounts payable | Posting invoices to accounting | Going through approved invoices, transferring them to accounting and | Time |

Figure 12. RPA ideas considered too complex.

Company X Oy has a lot of balance sheet accounts, where the transaction volume is high, but there usually is no general rule on how to match the transactions. It would require major changes in the ways of booking the transactions as well as changes in the systems to make the transactions better assorted.

Because there is no purchase order system in place, all purchase invoices require manual routing, except the ones, which have a contract in the system to which the invoice can be matched against. The number of possible dimensions, reviewers and approvers is high, and the robot would have to be able to comprehend the invoice pictures to get some of the data. For e-invoices most of the data could also be deciphered from a text file, but they are not currently utilized in the company, so it would require a separate project to start using them.

All invoices are locked in the system by the accounts payable team after they have been approved and before they are transferred into accounting. Most of the time, the invoices are just locked with one click and then moved on to the next invoice, but quite often there are comments or errors, which require changes in the posting or invoice basic data. It was considered a too complex process for the robot to perform.

Inputs and outputs of the processes were then considered. Understanding and listing the actual inputs and the trigger to start the process, as well as the outputs and the ending of the process was a critical stage in terms of understanding the process. It is crucial to determine where another process starts and another begins.

As mentioned, the trigger to start the process was determined in the workshop. In Figure 13 is an example of a process, where the trigger was considered too difficult to define.

| | | | |
|---|---|---|---|
| Accounting | Group accounting reconciliation | Transfer and reconciliation of company ledger transactions to Group accounting | Time |

Figure 13. RPA idea, where the trigger was unclear.

Group accounting reconciliation is done monthly for each legal company after all bookings have been made to the company. Currently, the last booking is not made at the same time each month; it varies. There is usually a time pressure to reconcile each company's transaction to the Group accounting system, therefore the reconciliation is done immediately after the last booking. As this varies, it would be difficult to tell the robot, when the reconciliation needs to be done.

The robot could be coded in a way, that it would perform the process, when, in example, it gets a certain email. However, this would distract other processes the robot is doing, as it would have to be available for this process. Also, the systems required are located in a remote desktop, which is very difficult for the robot to work on.

Group accounting reconciliation was still considered a viable option for the robot, keeping these limitations in mind. Therefore, it was selected for further specification.

Possible time savings were estimated for the selected processes. Time savings were calculated in terms of seconds/minutes/hours saved with one occurrence times the frequency times the number of people working on the process at the same time. One year was determined an appropriate review period.

In Figure 14 is represented an RPA idea, where the time savings were higher than initially expected.

| | | | |
|---|---|---|---|
| Accounts payable | Processing contract invoices | Matching invoices related to contracts to correct contracts | Time |

Figure 14. RPA idea, where time savings were higher than expected.

Invoices, which can be matched to a contract, have to be processed by an accounts payable clerk by adding a contract number on the invoice and saving it. It is a quick and simple process; it takes about 10 seconds for a human to process one invoice, depending on the lag of the system. It is a lot faster than processing invoices without a contract behind them, and there is need for increasing the number of contracts, because of this.

The number of invoices a day, which can be matched to a contract varies a lot every day and the number is increasing, when new contracts are created. If it is estimated, that there are 40 invoices a day, which can be matched to a contract, this means 400 seconds per day, 2 000 seconds per week and about 101 200 seconds per year. This comes out to over 28 hours per year on this process. It is then quite simple to calculate the ROI of the process, when the value of a working hour, the license of the robot and the development of the process are known.

Other possible benefits were also considered, when evaluating the processes. These can include quality, or the minimization of human errors, reducing costs or making sure laws and regulations are followed. In Figure 15 is presented examples of processes, where such benefits could be achieved.

| | | | |
|---|---|---|---|
| Accounting | Sub-ledger reconciliations | Reconciliations between ledger bookings and sub-ledgers, such as ERP and payroll systems | Quality, time |
| Accounts payable | Invoice circulation control | Going through invoices in circulation, separating invoices with delays on an approver and acting upon them | Quality |
| Accounts payable | EPR check | Checking the validity of the invoicing company's EPR registration daily | Quality |

Figure 15. RPA ideas, where other benefits besides time savings could be achieved.

Sub-ledger reconciliations are a vital part of validating the correctness of the accounting. Most bookings in the ledger derive from sub-ledgers, especially the ERP system. Because of the volume of transactions, it is very time-consuming to reconcile the ERP system and the ledger manually. If a software robot would do the task, hidden errors might be found and the correctness of the ledger would improve. This reconciliation is such a key element of the company's IT infrastructure, that it might make sense to also look at IT system-based solutions to fix the issue.

Money is wasted to late payment interests and other fees due to invoices being paid after the due date. Delays sometimes occur due to the fact, that the reviewer or the approver has processed the invoice too late. In example, there might be holidays or other absences and substitutes have not been set up to the system appropriately.

A software robot could potentially help to speed up invoice circulation and reduce late fees. The robot could perform different tasks, based on what is considered the most effective method. The robot could send different reminders about invoices close to the due date and after it, it could create lists of reviewers and approvers with the most delays, inform accounts payable clerks of comments on the invoices or transfer late invoices to other processors to go through.

The EPR register check is performed, when a new vendor is created. The tax authorities require companies to do an EPR check for their existing vendors four times a year. If an invoice for work is paid to a company without the company being in the EPR register, the

paying company should withhold taxes the same way as with salaries. If no taxes are withheld in a such case, the payer is accountable for the taxes it did not withhold from the invoice. A robot checking the EPR register validity of the companies, where invoices are received from, could save the company a lot of trouble with the tax authorities and also money by withholding the correct amount of taxes from invoices.

Company X Oy invests quite heavily on system development. For a software robot, this means regular updates to the systems it operates. Sometimes an update might not have any effect on the robot, might require changes to the robot's code, might make it impossible for the robot to perform the process or make the task the robot is doing futile. Regardless, it is crucial, that RPA is considered, when developing the existing systems or implementing new ones.

System-wise, the biggest obstacle Company X Oy has regarding RPA is the remote desktop it uses. A software robot can only utilize pictures in a remote desktop; it cannot use the attributes beneath. The VPN connection required to operate the remote desktop is also quite volatile, so extra fail-safes are necessary in robot's code. When the moment arises to update the systems operated in the remote desktop, the robot, and its limitations in a remote desktop, should be considered.

## 5.5 Plan for future RPA projects

As the RPA ideas are now evaluated and ideas selected for further development are described, the implementation costs of each process need to be evaluated. This means asking for estimations of needed working hours for each of the process from the external partner, which is currently handling the coding of the software robot. After this, sufficient ROI calculations should be made for each of the process.

The processes selected for implementation cost estimation are depicted in Figure 16.

| | | | |
|---|---|---|---|
| Accounts payable | Changes to vendor data | Processing changes to vendor data or checking the changes made by humans | Quality, time |
| Accounts payable | Invoice circulation control | Going through invoices in circulation, separating invoices with delays on an approver and acting upon them | Quality |
| Accounts payable | Processing contract invoices | Matching invoices related to contracts to correct contracts | Time |
| Accounts payable | EPR check | Checking the validity of the invoicing company's EPR registration daily | Quality |
| Accounting | Reconciliation of clearing and bank account ledger accounts | Checking daily that the clearing accounts match and the bank accounts match between accounting and bank | Time |
| Accounting | Deal data search from another system | Searching deal related data from another company's system and using it to match payments to receivables | Time |

Figure 16. RPA ideas selected for implementation cost estimation.

As mentioned in chapter 5.4.1, the main criteria used for evaluating the processes was the complexity of the processes. These are the first processes to be automated with RPA in their respective departments and for the future of RPA in the organization, it is very important, that the first processes are implemented with relative ease and the results can be quite clearly seen. This enables the employees to understand the possibilities and limitations of RPA better and generate new ideas for RPA.

When the implementation costs for each of the processes are calculated and ROI calculations are made, final selection can be made. From the very beginning of the implementation process, internal communication has to be taken care of. In the end, it is the employees who are working with the robot and their commitment level to the project makes a huge impact on the final ROI of the project. Also, training and instructions for the employees has to be completed in a timely manner.

In the long term, Company X Oy should evaluate its need for an RPA organization, which would include at least an RPA architect, RPA operator and RPA team leader. Depending on the number of robots and processes they are doing it does not have to be the selected

employees only role in the organization. As the number of robots and processes rise, the more financial and operational sense it makes to perform the coding and operating services of the robots in-house. The quality of the coding can be higher, when the processes to be automated and the organization is known by the coder. Also, support in case of errors, updates or user issues can be handled more flexibly.

The process on how to get new ideas for RPA and how to evaluate them should also be described to make sure best ideas are discovered and they are then reliably evaluated to achieve the best ROI. The process used by the author, which involved RPA training followed by workshops, worked quite well and was probably a good choice to acquire the first RPA ideas and increase employee's knowledge of the subject. Workshops should be used in the future as well to evaluate RPA ideas, but they can be acquired in different ways.

The author proposes adopting a Google Forms made available for the whole staff, at least the finance department, where RPA ideas could be briefly described. RPA team leader, or someone assigned to this task, would then contact the person responsible for the idea to get further understanding of the process. RPA ideas would be discussed and evaluated in team meetings and finance manager would mention recent ideas in monthly meetings to make sure employees know, that development in this front is being done, but also to remind employees about RPA and how their ideas can be heard.

It is important to assess carefully, which employees from the department the idea originated from to include in the RPA idea evaluation workshop. People are different and some are better in adjusting in different situations or seeing potential development areas than others. Team leader of the team in question should be there, but it is good idea to include the person responsible for the idea to the workshop as well as an employee from the team thought to have the correct mindset for development, if not already included.

# 6 Conclusions

The idea for this thesis arose, when RPA implementation project was first started in the Case Company X at the end of 2018 and the beginning of 2019. A need for the thesis was seen, because the technology was rather new for the company, there were a lot of different ideas

and misconceptions about it, and the people involved in the project wanted to understand RPA's possibilities and limitations in a pragmatical way. Even though, couple of years has passed since the project began, the subject is still very much contemporary. Not a lot has happened with RPA in the company since the implementation of the first processes in 2019, mainly because other IT projects have been prioritized above it, and the company would benefit from new RPA ideas and a clear process on how to acquire and approach them.

The main research question was: How to select and conduct the processes to be automated with RPA? The research sub-questions were: How should the possible processes to be automated with RPA be approached? Which processes should be automated with RPA next? Should the coding of the RPA project be done by an outside supplier or in-house?

## 6.1 Results of the thesis

The thesis aimed to generate a guide for the case company on how to select the processes for RPA, what things to take into consideration and how. By utilizing the guide, the case company should be better equipped in determining, which processes they can or should automate with RPA. The thesis also focused on evaluating possible processes to be automated with RPA and providing suggestions, which processes to automate next. Suggestion about how the coding of RPA should be organised was also presented.

All of the objectives of the thesis were achieved. A plan for future RPA projects was generated, which includes suggestions on how to produce and collect ideas for RPA, a guide on how to evaluate them and how to proceed after selecting the process to be automated. Also, concrete ideas on which processes to automate with RPA next were presented.

A suggestion for a future RPA organisation in the case company, along with its responsibilities and roles, was introduced. Since the company is in the beginning of its RPA journey, the costs of coding the robot themselves would be higher than the achieved benefits. However, this ratio will shift once they have multiple robots operating their processes. Hence, a suggestion was made to code and operate the robots in-house after the RPA organisation is large enough.

The generated guide, RPA ideas presented and the suggestion for a future RPA organisation are aligned with the theory base of the thesis.

## 6.2 Self-reflection of the thesis process

The thesis process was interesting, even though it took a long time. The subject was contemporary in the case company, but also in author's own work. Plenty of information could be found on the subject for the thesis. Even though, the author somewhat knew RPA before the thesis process, a lot was learned during the process. The author has already been able to utilize the new found knowledge in his work. The findings of the thesis will be utilized in the organisation in the future.

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