IMPLEMENTING ROBOTIC PROCESS AUTOMATION: CASE ANORA

Lappeenranta–Lahti University of Technology LUT

Master's Programme in Industrial Engineering and Management

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ABSTRACT

Lappeenranta-Lahti University of Technology LUT
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Keywords: RPA, implementation, automation, CoE

Organizations are under constant pressure to automate tasks to enhance productivity and they are constantly looking for digitalization tools that enable better ways of working. One of the tools that enables automating laborious and routine tasks is robotic process automation (RPA). Implementing RPA to enhance productivity across an organization is not straightforward and it requires planning and allocating resources. However, it allows tasks to be performed faster, more accurately and leaves employees with more time to focus on tasks that require intellectual decision-making.

The objective of this research is to determine how to successfully implement RPA to an organization and apply these findings to the case company. The thesis consists of a literature review and an empirical study that was done with semi-structured interviews for the employees of the case company. The findings from the literature review and the interviews are used to build a roadmap for the case company to implement RPA.

The results from the literature review and the interviews show that for successfully implementing RPA there is a need for human, technological and intellectual resources. For the implementation and on-going development and maintenance of RPA there needs to be central control that ensures that all the solutions follow the organization's standards for security, scalability, and change management. RPA enables quick wins but when strategically implemented it enables change in organization and increases business value in multiple ways.

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Organisaatioilla on jatkuva paine automatisoida tehtäviä tuottavuuden lisäämiseksi ja ne etsivät jatkuvasti digitaalisia työkaluja, jotka mahdollistavat parempia työtapoja. Yksi työläiden ja rutiininomaisten tehtävien automatisoinnin mahdollistavista työkaluista on ohjelmistorobotiikka (RPA). RPA:n implementointi siten, että se mahdollistaa tuottavuuden parantamisen koko organisaatiossa, ei ole yksinkertaista. Implementointi vaatii suunnittelua ja resurssien allokointia. Se kuitenkin mahdollistaa tehtävien suorittamisen sekä nopeammin että tarkemmin ja jättää työntekijöille enemmän aikaa keskittyä kognitiivista päätöksentekoa vaativiin tehtäviin.

Tämän tutkimuksen tavoitteena on selvittää, kuinka RPA voidaan implementoida menestyksekkäästi organisaatiossa ja soveltaa näitä havaintoja case-yritykseen. Opinnäytetyö koostuu kirjallisuuskatsauksesta ja empiirisestä tutkimuksesta, joka tehtiin puolistrukturoiduilla haastatteluilla case-yrityksen työntekijöille. Kirjallisuuskatsauksen ja haastattelujen tuloksia käytetään case-yrityksen etenemissuunnitelman rakentamiseen RPA:n implementoinnista.

Kirjallisuuskatsauksen ja haastattelujen tulokset osoittavat, että RPA:n onnistuneeseen implementointiin tarvitaan henkilöstö-, teknisiä ja henkisiä resursseja. RPA:n implementointia sekä jatkuvaa kehittämistä ja ylläpitoa varten tarvitaan keskitetty ohjaus, joka varmistaa, että kaikki ratkaisut noudattavat organisaation turvallisuus-, skaalautuvuus- ja muutoksenhallintastandardeja. RPA mahdollistaa nopeat voitot, mutta strategisesti toteutettuina se mahdollistaa muutoksen organisaatiossa ja lisää liiketoiminnan arvoa monin tavoin.

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Regarding this thesis, I am grateful to my employer, Anora, for giving me this opportunity to write this thesis and grow professionally in the company. Special thanks are in order to Veli-Mikko for supporting me during this thesis and believing in me, perhaps even more than I believed in myself. I would like to thank all my fine colleagues that were part of this thesis one way or another. I am grateful to Professor Timo Kärri and Post-doctoral researcher Antti Ylä-Kujala for providing me with guidance and challenging me when necessary.

The biggest thanks I owe to the people closest to me, my family, and my girlfriend Hanna. Without your unwavering support, I wouldn’t be where I am now. With wistful, yet excited feelings, I am writing the final words for my thesis which concludes my studies.

17.2.2022

Erkka Paavilainen

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ABBREVIATIONS

AI	Artificial Intelligence
API	Application programming interface
BPMN	Business Process Model and Notations
CoE	Center of Excellence
FTE	Full Time Equivalent
GUI	Graphical User Interface
MAP	Moving Average Price
ML	Machine Learning
PO	Purchase Order
POC	Proof of Concept
OCR	Optical Character Recognition
ROI	Return on Investment
RPA	Robotic Process Automation
VM	Virtual Machine
UI	User Interface
TVO	Total Value of Ownership
TCO	Total Cost of Ownership

1 INTRODUCTION

1.1 Background

New technologies drive change in organizations which increases efficiency, but they also change the way of working, create new jobs, change processes and lead to new business models. There is concern that automation may lead to a jobless future, however the automation potential of jobs is often highly overestimated. In most jobs, the bulk of tasks requires cognitive capabilities but there are still easily automatable routine tasks that waste employees' time and diminish their productivity. (Arntz et al. 2016) Robotic Process Automation (RPA) is a technology that was developed to automate these routine tasks. It reduces the time employees use for tedious repetitive tasks and allows them to focus more on jobs that require their cognitive capabilities. RPA is easier to implement than traditional automation methods and it does not change the information systems that are used in the automated process. (Van der Aalst et al. 2018)

The case company is Anora, a wine and spirits house in the Nordic region. They have used RPA solutions since 2019. In the beginning they used external service provider but as they started to scale up the use of RPA and implemented more solutions, the costs of new solutions increased faster than the perceived value. Therefore, the IT department started to map out the possibility of developing RPA solutions in-house. The first proof-of-concept solutions seemed promising but automating more complex processes proved to be difficult. Configuring robots in a robust way was not as easy as it was initially thought, and it demanded more human resources than was planned. Scaling the utilization of RPA also meant that the solutions need to be monitored and governed in an organized manner and there needs to be a solid scalable infrastructure for the robots. It was quickly realized that there was a need to rethink the way they implement RPA. This thesis tackles the challenge of implementing RPA for the case company.

1.2 Research objective and limitations

This thesis is done for Anora, a Nordic alcoholic beverage company. It is a company that is a result of a merger between Arcus and Altia. The merger was completed on the first of September

in 2021 (Anora, 2021). This thesis mainly focuses on the ex-Altia side since it was started at Altia before the merger was completed but when the future roadmap for Anora is discussed it covers the entire company.

RPA is used for automating tasks that traditionally could previously only be done by humans. RPA vendors often promise that the costs of automating processes with RPA are significantly cheaper than performing them manually, offshoring, or automating tasks with traditional process automation. Implementing RPA successfully requires careful planning, but it allows multiple benefits to be reaped faster than many other IT investments. In academia there are multiple studies done on the benefits of RPA and case studies of companies that have successfully implemented RPA. This thesis gathers the findings of previous studies on successful RPA implementation and applies the findings to an early-stage RPA implementation project.

Altia realized that they could utilize RPA to reduce costs and enhance their operations as a part of their Supply Chain Digitalization campaign. They have few tasks that they have already automated, and they have developed automations for processes that were implemented during this thesis. RPA is marketed as a low code solution that businesses can develop on their own. After making their first automations, the employees at Altia realized that even though RPA is a low code solution, automating full processes requires thorough knowledge of the processes, some programming skills and access control from the IT department. They also acknowledged that if they were to automate multiple processes, they would need to govern and maintain the robots. This would again produce additional costs on top of the licensing fees and development costs. Therefore, the objective of this research is to find out how to implement RPA successfully in an organization and apply these findings at the case company Anora. To reach the research objective, three research questions were formed:

1. *What resources are required to efficiently automate and govern processes with Robotic Process Automation?*
2. *What value does Robotic Process Automation provide?*
3. *What is Anora's 2-year roadmap with Robotic Process Automation?*

The first research question defines what resources are needed for successful implementation of RPA from an organization. The resources here cover human, technological, and intellectual resources, and the monetary values associated where applicable. The second research question evaluates the value that RPA can produce for an organization. Lastly, the third research question utilizes the findings of the previous questions and applies them to the case company. Altogether the research questions provide a comprehensive view of implementing RPA in the case company, but it also provides some generalizable answers for RPA implementation. As the case company has already chosen an RPA vendor, the evaluation of different RPA vendors is not included in this thesis research. The case company has their own robot and environment, and costs are calculated based on their setup. The cost comparison between different RPA sourcing options is left outside the scope of this research.

1.3 Methodology and data

This thesis research is divided into two parts between theoretical literature review and empirical part. In the literature review part, there is research into academic papers and commercial papers on best practices for Robotic Process Automation development, governance, and ways to evaluate the costs and benefits of implementing and maintaining software robots. The commercial papers were chosen based on their relevance to research and because of the relatively small number of recently published academic papers. The literature review also helps with estimating the workforce that is needed for the maintenance and governance of the robots.

The empirical part consists of semi-structured interviews for the employees of Anora and data that is gathered from automations that are in production, the costs of RPA licenses and the environment for the robot, and Anora's project management tool for tracking the development times for the automations. Interviews were conducted with two different groups, business, and governance employees. The business interviews were conducted to map employees' expectations of RPA, provide data for the total costs and benefits of implementing RPA solutions, evaluate the perceived value of solutions and help map willingness to manage and configure robots. The interviewees were ex-Altia employees that were involved with the RPA projects that are already in production. The interviews gave insight into the success of the projects and expectations for future RPA projects. The RPA governance interviews were

conducted for selected people in IT and development departments that have more experience with RPA or IT governance. These interviews gave insight into the company's IT governance model and how RPA would fit to that, what special consideration RPA needs for governance and the risks associated with RPA implementation.

1.4 Structure

This thesis is divided into four main chapters, Introduction, Implementing Robotic Process Automation, Building RPA roadmap for Altia and Conclusions. The introduction chapter provides the reader with the background for the research. The second chapter consists of a literature review of relevant subjects for implementing RPA. The third chapter provides the background of the case company, introduces the research design, and showcases the results and analysis of the research. The fourth chapter provides conclusions for the thesis and suggestions for further research.

2 IMPLEMENTING ROBOTIC PROCESS AUTOMATION

This chapter consists of five subheadings. These chapters introduce RPA as concept to the reader, outline the way RPA processes are developed from start to finish, display key concepts for RPA governance, building Center of Excellence and the responsibilities that it will have, and introduces the concept of Total Value of Ownership for RPA.

2.1 Robotic Process Automation Basics

Robotic Process Automation (RPA) is an umbrella term that is used for tools that operate on the user interface. It is different from traditional automation techniques because it uses computer applications the same way as a human would. There is no need to make changes to information system that is used in the process. (Van der Aalst et al. 2018) The term is somewhat confusing because software robots or bots are not what traditionally people would consider as robots. Also, RPA can be used to automate entire processes but often it is used to automate tasks that are parts of a certain process. (Taulli 2020, p. 3) RPA has potential to be highly disruptive and transformative technology for many industries. Software robotics is the application of using flexible tools to automate manual activity of business processes using IT systems. It works best to rules driven, data intensive processes that are repetitive. These processes can use multiple systems and include complicated calculations and multiple decision points if the process is stable and follows preset rules. (ACCA 2015)

RPA is computer coded programs that replace humans performing repetitive rules-based tasks, macros that are cross functional and that can work with multiple applications. For example, RPA robots can use email, enterprise, and web applications, move files and folders, read and write databases, data scrape, connect to application programming interface (API), make calculations and follow rule-based decisions. (Deloitte 2017) Lacity and Willcocks (2016) predict that in the future there will be digital and human workforce working together as teams. Each workforce performing the tasks they are best suited for. Robots will perform data intensive tasks such as extracting, gathering, and updating data for humans to assess and make decisions based upon.

The idea of computer programs interacting with the Graphical User Interface (GUI) is not new. Even in the 1990s there were talks of automations that would do manual and repetitive tasks for office workers. These early solutions were not reliable, and they were not implemented in an organized way. Modern robots are much more reliable than previous generations and they usually work in the intended manner if the underlying systems work reliably. New robots are also able to log their executions which leaves an audit trail for tracking. The robots also can have their own accounts which they use for accessing different applications and IT systems and the access rights can be adjusted accordingly. (ACCA 2015) RPA is at a pivot point now that it has moved from early adopters to mainstream deployment. Organizations are starting to realize the true potential of RPA as a digital transformation tool behind the hype. (UiPath 2021b)

RPA is most used to automate tasks that are normally performed by humans. Automation is done by configuring software robots to perform repetitive processes. The best processes to automate with RPA are processes where humans take input from one system and output it into another system. The robots perform the processes by following standard rules. Ideally robots will perform routine tasks faster and with higher accuracy than humans, which will free up time for employees to focus on more challenging tasks. (Willcocks et al. 2015) Humans need to manage exceptions that require cognition, intuition and situational decisions that cannot be programmed to the robot (Hofmann et al. 2019). Kääriäinen et al. (2018) found in their research on Finnish companies and public sector that three most popular use cases for RPA are reporting, updating data, and validating data in different information systems. They detected that most of the automations are in the sales-order-delivery process or in financial management department and the automated tasks were repetitive, and rule based which is consistent with other research on robotic process automation.

ERP systems were developed to have one system that contains all the functions of an organization and reduces manual work that needs to be performed. The reality, however, is that there still is a lot of manual work from transferring data from different systems and generating reports. Organization wide ERP systems generated a lot of value by combining data but there still is some data that needs to be attained from different systems outside the ERP. Many companies have plenty of legacy systems that are not integrated into the ERP system that the company uses. (ACCA 2015) Even with companywide ERP systems there are repetitive and

laborious tasks that employees must perform. These tasks are suitable for RPA and automating them helps employees focus on other tasks where decisions and critical thinking are required.

RPA is lightweight IT and traditional integration is heavyweight IT. The difference between the two is knowledge regime. Heavyweight IT is managed by the IT department and lightweight IT is business oriented. Lightweight IT does not change the underlying systems because it uses the presentation layer. Heavyweight IT integrations act on the data access or business logic layers which means that unless there already are APIs in place there must be some changes made to access the system. (Penttinen et al. 2018) It is important to distinguish between the two to use the best possible solution for automation. There can be some overlap in tasks that can be done with either heavyweight or lightweight IT. RPA technology is not part of an organization's IT infrastructure, but rather it sits on top of it. RPA is not designed to be a business application, but it allows humans to access business applications. These two facts allow quick implementation without altering the existing infrastructure. (IRPA 2015)

RPA solutions are divided into four groups. Assisted RPA runs on users' own workstation and assists in tasks to increase individual workers' productivity. Unassisted RPA runs in Virtual machine (VM), and it can be used to automate entire processes. Autonomous RPA is the next progression from unassisted RPA where there can be some build in decision making like handling changes in priorities. Cognitive RPA means that there are AI solutions integrated with RPA that can be used in automations. (Everest Group 2018) Hofmann et al. (2019) divide software robots into two groups based on the level that they automate processes: robots that work with employee intervention and under supervision are considered attended robots, unattended robots work without any human intervention at all. Taulli (2020, p. 6) notes that, with the addition of artificial intelligence (AI) there could be third group of robots that are cognitive or intelligent robots, these intelligent robots can utilize machine learning to teach themselves to handle exceptions, make decisions and interpretant information. Implementing AI and Machine Learning (ML) to RPA allows robots to learn from data to respond to arising problems and make decisions based on past executions of the process by an expert (IRPA 2015). According to Deloitte (2017), even though cognitive automations are technically possible with the current technologies most organizations that have implemented RPA are not currently utilizing cognitive automation.

RPA generates a lot of data but most of the time this data cannot be used to build machine learning models. Evolving RPA project to ML project creates a ML project that has not been scoped. (Boulton 2019) This finding would suggest that ML should be considered separate entity that can be implemented on top of RPA, but it must be considered as a separate project from building the automation. Willcocks et al. (2019 p. 57) consider RPA as an automation platform that can house AI or ML and other advanced technologies. Even though RPA can be used as a platform for more advanced technologies it is important to distinguish that RPA itself does not need advanced technologies.

According to Gartner review on different RPA vendors the top-rated ones are UiPath, automation Anywhere and Blue Prism (Gartner 2021a). All of these state on their websites that their technology allows anyone to configure software robots that automate routine tasks that humans perform within digital systems. All of them also offer integrating machine learning (ML), artificial intelligence (AI) and optical character recognition (OCR) to improve these software robots. (UiPath 2021a; Automation Anywhere 2021; Blue Prism 2021)

RPA development is significantly easier than traditional automation and it does not necessarily require programming skills. This means that people with business operations knowledge and process knowledge can configure software robots. (Willcocks et al. 2015) This does not mean that automating tasks or processes is necessarily easy. Even prioritizing and evaluating the processes to be automated requires some specific skills. The next chapter goes through the process of developing automations with RPA.

2.2 Choosing, Mapping, and Developing Processes

Before automating tasks or processes can be automated the process suitability for automation must be evaluated. IRPA (2015) states that RPA can be used for any process that is definable, repeatable, and rules based. The process must be thoroughly mapped with all the possible exceptions before a software robot can be assigned to perform the tasks needed.

The benefit of RPA solutions is that they are fast and easy to implement which means that they can be developed outside of the IT department. Non-technical employees can develop solutions for their own needs or hire external vendors that make simple automations for routine tasks. This allows automation for processes that were previously thought too insignificant to automate. It also allows integration for systems that were previously inaccessible due to missing APIs. (Penttinen et al. 2018)

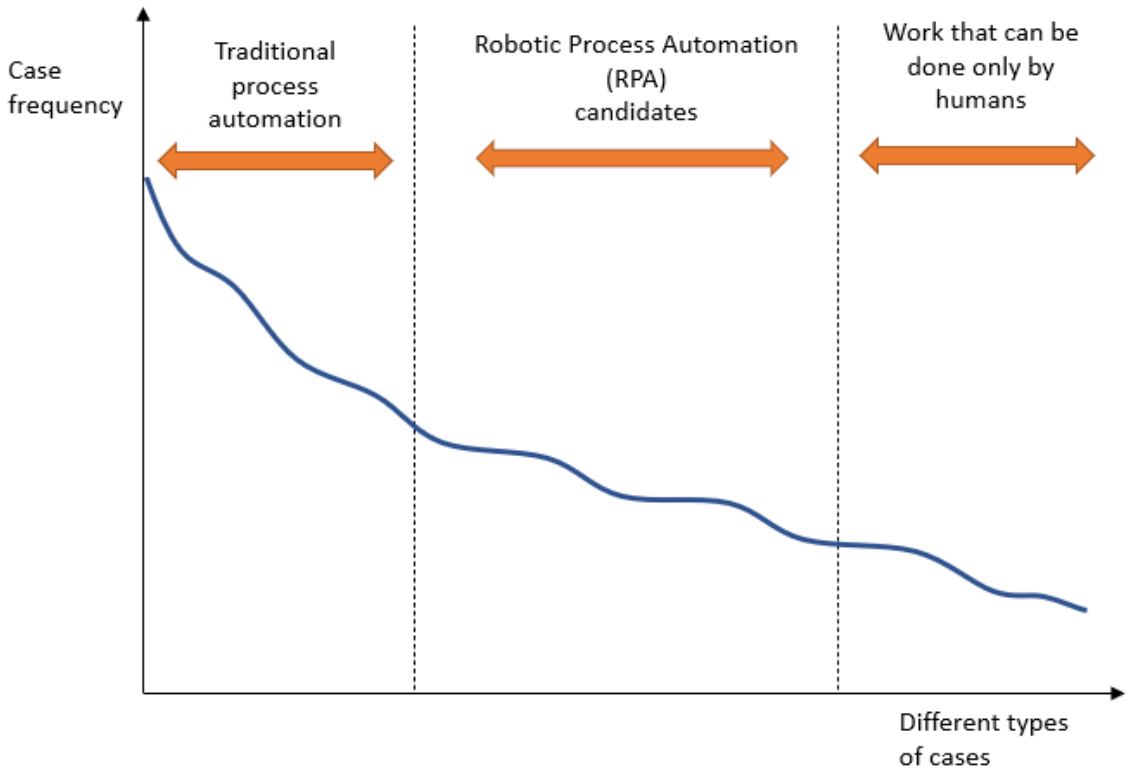

Figure 1 Potential automation cases for automation (Adapted from van der Aalst et al. 2018)

Figure 1 shows tasks that should be automated with robotic process automation. If the case frequency is high the task is usually already automated, or the process should be automated with traditional process automation methods. RPA tackles the middle ground that traditionally could only be done by humans. This still leaves the infrequent and exceptional cases that need to be performed by humans. (Van der Aalst et al. 2018) These automation candidates should be evaluated and prioritized to choose the right cases with most benefits. According to Accenture

(2016) RPA is only one tool in technology stack that companies have, before automating a process there should be consideration whether RPA is the right solution. In many cases RPA is not the entire solution for automating a process. Grung-Olsen (2017) also notes that RPA should be a tool in the automation stack of an organization. RPA can be complimented with different advanced technologies such as chatbots, image recognition, ML, and speech recognition. With these advanced technologies the scope of processes that can be automated with RPA grows.

Business operations should be the leaders in automation projects. They can best select the process candidates for automation. If the managers in business know the requirements for a process to be automated, selecting processes with the biggest automation potential from their responsibilities is easy. (Lacity & Willcocks 2016) As the development is significantly easier than with traditional automation tools even the development can be pushed towards business operations.

Before implementing RPA for a process, the process should be standardized. Complex processes lead to complicated automations that are difficult to design and configure which leads to increased costs and higher chance for business disruptions. Configuring the process requires mapping the process to the keystroke level. Often processes differ from the documentation when they are mapped to this level of detail. Before implementing automation, business needs to address any issues in the process. It is important to decide whether to automate the current process with minor changes or to re-engineer the process before automating it. (Deloitte 2017) According to Penttinen et al. (2018) before automating there should be investigation for the existing interfaces in an IT system and the stability of these interfaces. They then advise based on the investigations to consider which automation tool will be best fit for the purpose.

Lean and Six Sigma can be used to streamline processes before automating them. Lean is based on recognizing the value of a process, mapping the value stream, and optimizing the process flow. The processes are constantly improved in lean to perfect the process flow and value creation. Six Sigma is about detecting defects, understanding their causes, and improving processes. The way Six Sigma works is using statistics to determine the number of defects and compare it to total number of defect opportunities. (Taulli 2020 p. 56;60;62) When the process is streamlined and the number of defects is minimized, automating it is faster and there is less

chance of failures. Taulli (2020 p. 72) notes that it is important to find the right balance between improving the processes and automating the processes, as the uses of these process improvement techniques can significantly delay the implementation of RPA.

According to (Taulli 2020 p. 279) process mining can be used to determine processes to be automated with RPA. Van der Aalst (2016 p. 25) defines process mining as a tool that extracts process related data from enterprise system and discovers a process model. Process mining achieves more accurate models than hand-made or exported ERP system models. The models created with process mining depict the process more accurately with the flaws in the process and thus provide more value to the users of the model. (Van der Aalst 2016 p. 30) Process mining can be used to discover processes to be automated. Because it includes the flaws and bottlenecks of the real-world process, it can also be used to improve the processes and make sure that there will not be redundant automations that could be eliminated by improving the process itself. (Taulli 2020 p. 292)

RPA can be viewed as a tool for fast integrations that offer solid business cases. However, because most integrations need to be robust RPA is not an optimal solution. A complementary way of looking at RPA is a source of innovation, fast iterations, and a way of getting a minimum viable product. RPA solutions are prototypes that can be used for testing the business cases and whether there should be traditional integration put in place of the RPA solution. The RPA lifecycle would be identifying manual processes most suitable for automating, automating with RPA, and evaluating the business cases of the RPA solutions. Processes with the best business cases should be integrated with more robust solutions, and the worst solutions should be scrapped. Processes between these two can be left running on the RPA solutions. (Grung-Olsen 2017) Since the development of automations is faster than with traditional integrations the losses of scrapped RPA solutions will not be too significant.

RPA can be labeled as lightweight IT. Heavyweight IT is more focused on keeping operations running and focuses on robustness of solutions. RPA is focused on rapidly developing new solutions that increase productivity in an organization. RPA is dependent on heavyweight IT because the robots work on UI level of other applications that are considered heavy weight IT. Organizations should bridge the gap between heavyweight and lightweight IT by developing

better change processes. Bridging the cap makes lightweight solutions more robust and viable for long term use and heavyweight solutions more agile and compatible with changes in business needs. (Grung-Olsen 2017)

Table 1 shows the difference between lightweight and heavyweight IT. The differences presented can be used for determining whether a process should be automated with RPA or system integration. As RPA becomes more reliable, some solutions that in the past would need heavyweight IT can be completed with RPA.

Table 1 Difference between Lightweight and Heavyweight IT (Penttinen et al 2018)

Feature	Lightweight IT	Heavyweight IT
Type of systems	GUI automation	Back-end systems automation
Technology	Emergent, spontaneously adopted	Mature, proven
Culture	Business and process improvement	Software engineering
Focus	Agility, innovation, speed	Security, efficiency, reliability
Application area	Unknown development of new services	Well-understood and known service
Invasiveness	Non-invasive, presentation layer	Invasive, data-access and business logic layers
Problems	Isolated systems, privacy, and security issues	High complexity and costs of systems

Agaton & Swedberg (2018) found in their research shortcomings with the current models that are used for evaluating process suitability for RPA. Process evaluating models for RPA suitability in academia and industry had slight differences, but the most principal elements were the same. Mapping processes with Business Process Model and Notation (BPMN) is good for mapping the process on a high level, but it lacks some information that is crucial when configuring software robots.

BPMN does not convey information from data sources with enough detail. When configuring software robots, it is essential to know all the data sources of the process. BPMN also does not convey if a gateway is a decision or if it is just a split in a process. When mapping a process for

RPA there should be indications on parts that are decisions and what is the basis that the decision is made on. BPMN uses lanes for different elements of the process are divided between roles, people, or departments, but it does not show which information systems are used. They proposed a process model tool BPMN-R which tackles these shortcomings of BPMN. It added labels for different data types, symbols for decisions and uses pools to convey systems instead of people. This allows mapping processes in a way that is better for configuring software robots. (Agaton & Swedberg 2018) Mapping the processes the way that the robot is development helps the configuration. For the robot development it is irrelevant which employee performed the task previously, but it is of utmost importance to know which systems are used in the process.

Once the process has been chosen for automation and it has been mapped it is time to develop the robot for the task. After the process has been mapped keystroke by keystroke the actual implementation is swift, and many times it can happen as fast as 14 days (ACCA 2015). The development time varies depending on the complexity of the process and the number of possible exceptions.

Even if robotic process automation development is easier than traditional software it still requires some coding. Developers need to know how to use chosen RPA tool and understand various kinds of workflows and approaches for automating tasks. To develop RPA, one needs to understand variables, loops, and the difference between how humans and computers optimally perform certain tasks. (Taulli 2020, p. 33;152:156;159) There are pros and cons for diverse backgrounds that RPA developers have. RPA developers from business operations do not need to have the process mapped as thoroughly but they may lack some technical expertise that an RPA developer might have.

Business units can develop their own robots because the solutions are relatively easy to configure. This allows the units to develop robots with a bottom-up approach and choose the processes which they think are best suited for automation. The business units may need training and mentoring at first, but after a moderate amount of training they can independently develop most automations. Even though the business units can develop the robots by themselves they should consult specialists in various stages of the automation process. Software architects can assess the processes to be automated and offer insight into different automation methods. There

should be some quality checks during development and before putting the robots into production. These quality checks ensure that development guidelines are followed, and the robots will be robust enough. During these checks, the reviewer can also see if any of the steps can be done by already made re-usable components. (Noppen et al. 2020) Other papers agree with the need for oversight of the development. Even though the configuring of the robots may be simple, organizations should not let their employees develop their own solutions without any oversight. If there is no common security, risk mitigation and quality standards the solutions will be developed as isolated projects. Isolated solutions increase the risks and hinder the scalability of RPA robots. (Accenture 2016) Lacity & Willcocks (2016) remark that centralizing the development enables the use of reusable components which reduces the development time as the number of automations increases. A centralized RPA Center of Excellence (CoE) is paramount part of implementing RPA in an organization (Boulton 2019).

Agile development of robots allows solutions to fail or succeed faster which helps with adapting approaches to different processes. Doing sprints with clear goals and deliverables helps to keep the stakeholders engaged in the project. Showing the iterations of automation helps employees to understand the development process better and keeps them more responsive. (Deloitte 2017) People whose jobs are affected by RPA should be kept informed on the project (Boulton 2019). Having the business operation involved in the development of solutions can reduce the resistance to change and eventually can lead to business operations driving the RPA implementation.

According to Lacity & Willcocks (2016) organizations can use different kinds of sourcing options to automate their processes and tasks. In their paper the authors present three options for sourcing:

1. Insourcing: buying the software licenses directly from service provider and automating the processes with their own resources.
2. Insourcing and consulting: buying the licenses from the service provider but engaging consulting firm for services and robot configuring.
3. Outsourcing: Using external firm for automating the entire process. Usually, the company is only responsible for identifying the to be automated processes.

The sourcing option that an organization chooses affects the resources that are needed for implementing, maintaining, and governing RPA. Even when fully outsourcing RPA development there is still a need to centrally control the RPA implementation. This central control unit, RPA CoE, is explained in the next chapter.

2.3 Robotic Process Automation Center of Excellence

Implementing RPA requires strategical thinking from the organization. Organizations that have support for RPA implementation from the top executives reach their strategic goals better than organizations that have only divisional support. (Lacity & Willcocks 2016) Gathering a team that drives the organization wide implementation of RPA makes it easier to have it as a strategic initiative.

CoE is one of the Critical Success Factors of implementing RPA. CoE is responsible for automation governance, skill development, process assessment and organization wide support. CoE ensures that best practices are followed, projects are not duplicates, and reusable automation components are used where possible. (Accenture 2016) Building a CoE is paramount for successful implementation. CoE should develop business cases, calculate potential cost optimization and Return on Investment (ROI), and measure progress against set goals. In a small organization the CoE can be small and nimble that adapts to current requirements. There can be different technology staff that are responsible for the actual development and implementation of automation. (Boulton 2019) Lacity & Willcocks (2016) note that the role of CoE is to support business units to identify automation opportunities, prioritize projects, build solutions, and monitor the software robots that are in production. CoE also establishes standards and best practices for robot configuring and tracks the business performance of automations.

RPA needs support to perform optimally. CoE is responsible for centrally managing the digital workforce of the company. Most common support model for RPA is a hybrid model where there is centralized control that coordinates the digital workforce on high level but there is local ownership of solutions. Right-sized central governance with a good balance of flexibility and structure will help with achieving change faster with RPA. (Deloitte 2017) Ekren (2018)

recognizes three different models for the RPA CoE: centralized, decentralized and hybrid. The centralized model has all the capabilities that are needed to drive RPA across the entire organization. All units of organizations will use the same centralized resources. The decentralized model houses RPA resources in business units. Centralized model is easily scalable, but it is slow to distribute across the organization. Decentralized model is difficult to scale up and it does not have centralized control which can lead to siloed projects. A hybrid model is a combination of the two where there will be centralized control, but RPA resources can be spread across different business units. A hybrid model is usually the best option for organizations as their RPA capabilities mature.

The Center of Excellence can be fully in-house, fully outsourced or it can a mix of these two. While forming the CoE the organization should consider what skills they have in-house already and what aspects they want to have full control over. Some of the roles can be both outsourced and in-house. For example, an organization can have an RPA developer and use external consultant when needed. (Anagoste 2018) Whether the CoE is outsourced or not also depends on the sourcing strategy that the organization has chosen for RPA development.

The size of Center of Excellence size ranges from small team of two people to a much larger team with multiple roles (Taulli 2020). UiPath lists 9 distinct roles for CoE: sponsor, champion, change manager, business analyst, solution architect, developer, infrastructure engineer, supervisor, and service support. RPA sponsor is someone from the business side who will establish RPA as an enterprise-wide strategic initiative, champion drives the adoption of RPA across organization, change manager ensures that RPA projects run smoothly and everyone involved is well informed, business analyst is the subject matter for automated processes in business unit, solution architect defines architecture for solutions and ensure that it is aligned with enterprise guidelines, developer develops, tests, and assists with the implementation of solutions, infrastructure engineer ensures that the robot infrastructure is up and running, supervisor manage, orchestrate, and control the robots as part of the operational environment, service support is the first line of assistance regarding any problems with the robots. (UiPath 2021b) The workload of the CoE team depends on the number of automations that they need to govern and develop. If there are multiple automated processes the organization will need more

dedicated employees to keep up with the maintenance and be able to develop new processes. (Anagoste 2018)

Organization wide automation goals require support from senior management and even C-level approval. If there is only divisional support or RPA is IT driven project organizations have not reached strategic level goals at the same rate as organizations with executive level sponsors. A successful project requires support from multiple levels of management. (Lacity & Willcocks 2016) It is important to have high level executives in the CoE to enable maximum strategic reach for projects.

Scaling the automations requires collaboration between business units and the IT department. However, most organizations are siloed and do not have regular assessments for alignments between business units, IT, and centralized automation department. In fact, many organizations do not have dedicated CoE. Having centralized control over RPA and good cooperation with IT and business allows developing automations strategically and have them run reliably. (UiPath 2021c) The CoE should have knowledge from different business units to have know-how from strategic, technical, and business operations standpoints.

The tasks of CoE are diverse ranging from practical to strategic level. The tasks also differ based on the type and size of the CoE. The most important job for CoE is to drive the RPA implementation in the organization. Lacity & Willcocks (2016) note that RPA needs to be strategic focus, but it also enables strategic chance in organization. Automating repetitive tasks allows the human workforce to focus on tasks that will create more value with their input. The CoE are responsible for enabling this to happen.

The tasks for CoE start even before the implementation since choosing the right RPA tool for the organization is important. (Accenture 2016) Implementation should start by researching different RPA solutions that are used in the industry in different kinds of companies. Using external consultants for determining what RPA can do for an organization and what are the limitations. Third-party experts can give insight into usual pitfalls, risks and mistakes that might otherwise be left unnoticed. (IRPA 2015) When choosing an RPA tool for organization the CoE must consider the evolving needs for technology. In the early stages of implementing

organizations value ease of developing and coding the robots high, but organizations that are in the scaling phase of implementation rank robot maintenance and risk mitigation higher in importance. All organizations appreciated good support, ease of access to product training and a good ecosystem to technology partners and implementation partners. More mature RPA adopters are more satisfied with their RPA results. This is because they can benefit from economies of scale, their employees have had time to learn RPA skills and they have extracted complementary values. (Everest Group 2018) The CoE should be formed as early in the RPA project as possible, and it should be evolved to meet the current needs of the organization.

In the RPA project it is important to build a solid foundation which allows higher performing automations that are less error prone and easier to develop. Solid foundation allows for more agile development and quicker decision making. RPA projects can be developed in a tight schedule and problems are found and fixed along the process. With solid foundation and agile development, organizations achieve high velocity change. One of the things affecting the scalability is robot architecture. Robot architecture means the way solutions are designed, coded, deployed, and integrated with the human workforce. A well-designed digital workforce can be much more productive than organically formed robot workforce. (Deloitte 2017) Scaling automations can be sped up with some matters that need to be considered when designing the enterprise RPA. These include scalability of solutions with component libraries and scalable environment for the robots. There also needs to be rules for error and exception handling as well as rules for regulatory compliance. All the solutions must be designed with scalability in mind. (Everest Group 2018)

Deloitte (2017) report found that most companies had started their RPA journey but there was only a small number of these companies that had scaled their RPA with over 50 robots. To scale RPA across an organization they need to think strategically from the beginning. They need to set ambitious goals and make choices to reach those goals. To think strategically from the start of the RPA journey, organizations will need an executive level sponsor in the project. The benefits of the digital workforce should be evaluated across the whole organization and not just in silos in different business functions. Even though it is necessary to think strategically from the beginning it is also important to start small and expand from successful small projects. (Deloitte 2017) CoE is responsible for making sure that the RPA infrastructure is scalable. The

virtual environment for robots needs to scale as the number of robots increases. As more employees start to work with RPA, software installation needs to be easy and service capabilities need to work on a large scale. (Accenture 2016) Because scaling RPA across organizations is where many organizations fall short of their goals, one of the main priorities for CoE should be to ensure scalability.

The CoE should be part of the choosing, mapping, and developing processes. Lacity & Willcocks (2016) mention that CoE should assess processes that are proposed by business and detects whether RPA is suitable solution. Depending on the organization, CoE can also be responsible for developing, testing, and controlling the software robots. Noppen et al. (2020) add that The CoE for RPA needs to perform technical reviews for the robots that business units have developed before they are put into production. This ensures that all robots that are live are up to the same standard that is defined at the organization level. At the same time the CoE can determine if there are components that are suitable for re-using.

RPA adoption for organizations has led to skill development for employees or acquiring new skills in organizations. Implementing RPA on a large scale requires RPA developers and quality assurance engineers but also project, process, and change management. The people who work alongside robots need to acquire new skills. In many cases it is better to have the ownership of RPA solutions in the business units. Because the skills needed to implement RPA are so specialized many organizations opt to use third-party partner to provide advice and skills that their own organization lacks. (Deloitte 2017)

Change management is important any time there are transformations in the ways people work. It should be clear to all employees what the company is trying to achieve with their automations. If the automations affect customers or other stakeholders in the process, they must also be informed about the end goals of the automation and the progress of the project. Many employees may fear for their job because of the new digital workforce. Clearly communicating the goals of the automation projects reduces the anxiety that the employees may be feeling. In most case companies' automations have affected parts of many jobs rather than making some jobs obsolete. Most of the effects in employment were reductions in hiring or outsourcing and increases in productivity rather than layoffs of full-time employees. (Lacity & Willcocks 2016)

One of the tasks of CoE is to promote RPA and make sure that employees do not feel left out. They need to promote that RPA automates the mundane tasks which will leave more time for employees to perform the more complex cases. Even before the implementation of the RPA solution the solution leaders need to think about the allocation between humans and robots. The employees need to be assured that there will still be tasks left for them to perform. (Accenture 2016) Boulton (2019) adds that in all stages of RPA implementation employee expectations should be managed. The company should set realistic goals and use Proof of Concepts (PoC) to demonstrate RPA capabilities to ensure that the employees feel positive about RPA.

As organizations scale their automations, they need to rethink the skills that their business units need. There will be new roles created but also current roles will gain new responsibilities as the automated processes will need oversight and the robot executions must be monitored. As the digital workforce will take over the repetitive tasks, employees are left with tasks that require creativity, problem-solving skills, judgement, and emotional intelligence. (Lacity & Willcocks 2016) The CoE should also enable for employees to learn the new necessary skills and help with the transitions to new roles.

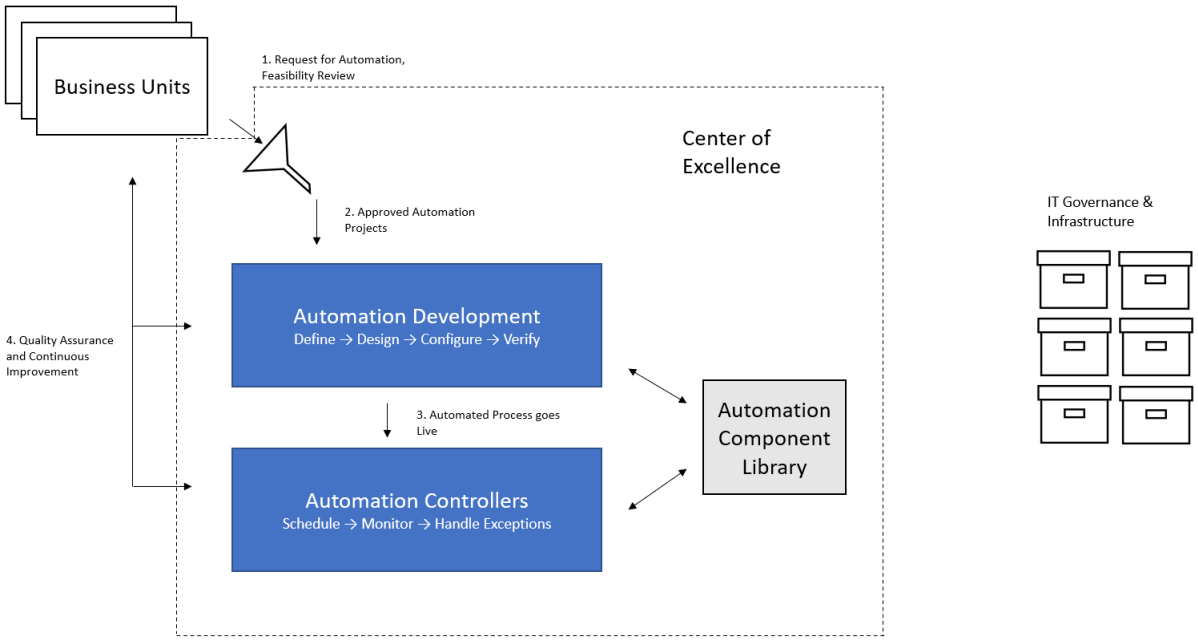

Figure 2 Components of RPA CoE (Adapted from Willcocks et al. 2019 p. 123)

In Figure 2 is pictured a mature CoE where business units request processes to be automated that are then filtered and ranked by CoE. Approved processes go through automation development pipeline before going live. The live automations are running based on business rules or schedule, and they are actively monitored for exceptions. The previously made automations provide components for reusable component library which in turn speed up the development times. There is also a continuous cycle with business units for quality assurance and continuous improvement during the development of automations and on live automations. The IT Infrastructure and Governance are separated outside the RPA CoE, but governance for automations is the responsibility of CoE. The RPA governance is presented in the next chapter.

2.4 Robotic Process Automation Governance

Governance specifies who can make decisions and how. It ensures that decisions are made by the right people, who are accountable for the decisions and that desirable behaviors are encouraged. Management on the other hand is the process of making and implementing decisions. A practical high-level example would be governance determining who has the right to decide on how much is invested in IT and management determines the actual investments. (Weill & Ross 2004 p. 8-9) Good governance harmonizes decisions, increases profits, and allows introduction of new business opportunities (Weill & Ross 2004, p. 14-15) IT governance aims to improve overall management of IT and deriving improved value from investments in IT (Gartner, 2021b).

According to Weill & Ross (2004, p. 10) to be effective, IT governance must address three points:

1.What decisions must be made to ensure effective management and use of IT?

2. Who should make these decisions?

3. How will these decisions be made and monitored?

RPA is no different from other IT systems in relation to need for governance. Boulton (2019) mentions that there should be governance for the robots that are in production. There should be monitoring and alerting systems for situations where the robot fails or performs in an

unexpected way. Grung-Olsen (2017) notes that RPA solutions are prone to failure because they interact with the user interface of underlying applications that are used in the process. There must be effective and reactive coordination between application and RPA portfolio lifecycle. The unreliability of RPA causes the need for extra care when governing RPA solutions. Accenture's (2016) paper notes that robots need operational governance and management all throughout from development until the end of their lifespan. Up to date management ensures that the robots are updated when needed.

When implementing RPA, it is important to get everyone involved in the decision making to get on board from the ground up all the way to the executive level. In Deloitte's (2017) report they found out that C-suite and functional leadership had the highest approval ratings of all the stakeholder groups. Managers and team members were split between being supportive of RPA implementation and not supporting. IT was the function group with the lowest support for RPA implementation with only 31 % in support for it.

Lightweight IT can lead to disconnected applications and gadgets that are not included in the IT infrastructure. Because the solutions may not be centrally controlled there can be privacy and security issues which can be harder to address. RPA is also dependent on the reliability of the underlying systems that it uses. (Penttinen et al. 2018) RPA should be seen as a strategic initiative from the beginning of the implementation. All the solutions should be built with scalability in mind. This includes configuring the software robots, building component library, optimizing IT infrastructure, and building a maintenance model for the solutions that are in production. (UiPath 2021c) For security and risk management robust logging for robots to create audit trails is important. The organization must have good cybersecurity in place that protects the information systems and the robots from external threats. If robots have their own accounts for information systems, access rights must be set for the robot. The company must design access rights and different roles for employees who can access robots. (Everest Group 2018)

Robotic Process Automation is considered lightweight IT because it uses the presentation layer of computer systems and does not interfere with the business logic or data access layers. It uses the user interface the same way a human would and accesses systems by logging in. However

badly implemented RPA can introduce operational risk, decrease security and it will not be scalable. (Willcocks et al. 2015) Robots are in most cases more secure than humans as they only perform the tasks that are assigned to them in a way that is programmed. However, it is important that IT function makes sure that there are no hidden vulnerabilities that malicious people could utilize by sending robots data that is updated to information systems. (Kääriäinen et al. 2018) According to Hofmann et al. (2019) RPA tools can access business logic and data access layers, which means that these features need to be also governed.

Because RPA uses mostly the user interface of computer systems these systems need to be compatible with RPA (Hofmann et al. 2019). If the underlying systems are updated the RPA solutions need to be changed to be compatible with the underlying system. These changed solutions have to be tested as new solutions. The employees responsible for solutions need to be proactive with the changes that have to be made. (Accenture 2016)

In RPA implementation it is important that think about the operating model and design of the architecture. Companies need to think how all the bots will work together and that there will be no business disruptions. (Boulton 2019) Once an organization has many automations in production environment, and they have reorganized their employees to other tasks, they may lack resources to perform the automated processes in case the robots fail (Kääriäinen et al. 2018). As robots start to do business critical processes the robustness of solutions and fast reactions in case of process failures becomes paramount.

RPA blurs the line between IT and other departments. When business units are given the ability to quickly automate tasks or processes there may be complications in the collaboration between IT and other units. For RPA projects to work successfully there needs to be cooperation between the business employees and IT employees. (ACCA 2015) Accenture (2016) listed not involving IT among the most common mistakes when implementing RPA. They point out that while the development must be pushed towards business, IT needs to make sure that the underlying systems run reliably and are compatible with RPA.

RPA is seen as a big concern for the IT department in some organizations. However, once it was proved that the robots only use the user interface and they are compliant with security,

scalability, auditability, and change management, the IT accepted RPA. (Lacity et al. 2015) Support for RPA from IT is crucial to successfully implement and scale RPA across organizations. IT is essential for setting the infrastructure for scalable solutions. Getting IT on-board for RPA can be difficult because they are often focused on more pressing and large-scale challenges. IT should be part of the governance of RPA, and they should be responsible for fitting RPA to wider IT strategy. (Deloitte 2017) IT must ensure that all automations are compliant with IT security policies across the entire organization. (Accenture 2016)

Early involvement of IT means that the configured RPA solutions follow IT requirements for security, scalability, auditability, and change management. (Lacity & Willcocks 2016) IT department are responsible for building and maintaining effective infrastructure for the RPA robots and making sure that all the solutions follow the corporate IT security guidelines. Usually, the IT department also has the best knowledge of testing, change management and budgeting and benefit realization for IT solutions, so they should share this knowledge with the rest of the company. (UiPath 2021c) Boulton (2019) adds that IT involvement ensures that business units have necessary resources for RPA implementation.

2.5 Total Value of Ownership

Total value of Ownership (TVO) takes into account total costs, expected business benefits and strategic returns. TVO includes hidden benefits and costs that are associated with RPA. These are not included in traditional TCO and benefits calculations and over time they may be crucial in some cases where RPA has been strategically implemented to a company. (Willcocks et al. 2018) TVO benefits come from the ways business modifies its practices based on new technology and not only the technology itself. This shifts the focus from recovering costs to leveraging the return. (Luftman & Muller 2005)

TVO concept for RPA was developed to ensure that business cases are driven by total costs, multiple expected business benefits, and the multiple strategic returns from future businesses and technical options made possible by RPA. The concept tackles the challenges of traditional ROI calculations which lead to under investments, the lack of long-term horizon, and failure to invest in strategic options and imperatives. (Willcocks et al. 2019 p. 60)

TVO which consists of The Total Cost of Ownership (TCO) and the Total Benefits are shown in the Figure 3. Total Cost of Ownership can be divided into Activities and Resources. The activities include things that the company must actively do to maintain and develop RPA. Resources are things that must be possessed to and allocated for RPA implementation. The Total Benefits are divided into three parts: Efficiency, Effectiveness, and Enablement. Efficiency means the way RPA makes the current processes better. Effectiveness is a bigger entity that is made possible by the increase in efficiency that includes improvements in business and increasing the value of employees. Enablement is the future value that RPA can provide such as intelligent technologies and new business opportunities.

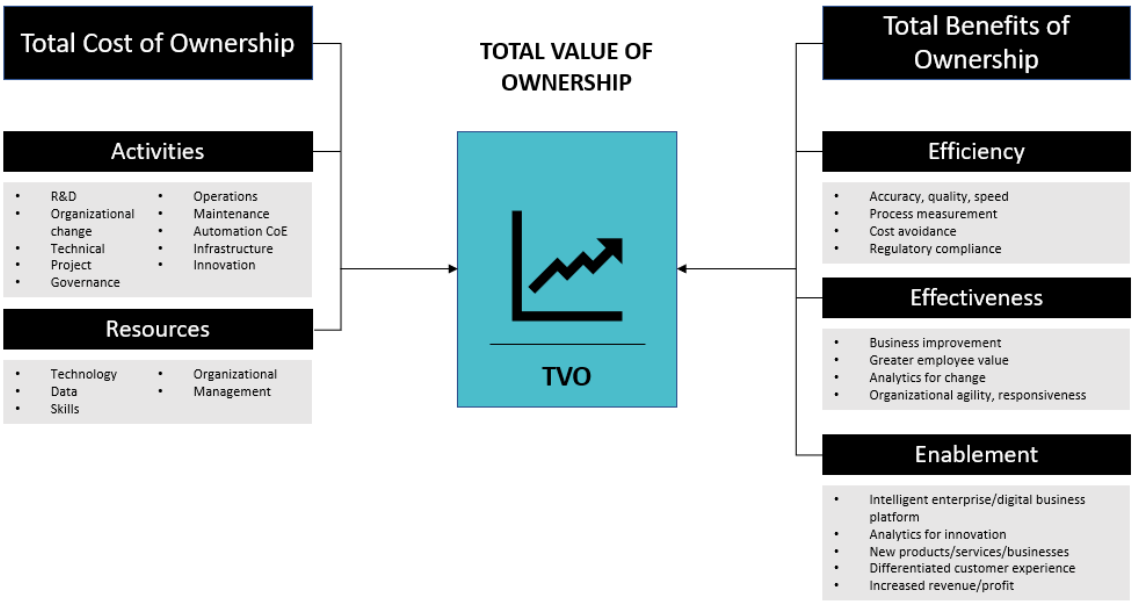

Figure 3 Total Value of Ownership (Adapted from Willcocks et al. 2018)

The evaluation of IT investments has always been difficult. Organizations have failed to fully investigate risks and potential costs, and understated maintenance and rising human costs. Many organizations using traditional ROI analysis understate real costs which may exceed technical costs threefold. (Willcocks et al. 2019 p. 59) Most organizations using RPA use

simple FTE-based evaluation methods for cost/benefit analysis which understates both costs and benefits. These mistakes in both directions may cancel each other out, but it may lead to wrong assumptions in the future. (Willcocks et al. 2019 p. 130)

Organizations have become more and more interested in RPA because the concept is easy to understand for non-technical people and new automations unlock value from legacy systems without big investments. Fast implementation also provides results fast and with little resources. Leaders are also interested in the promised ROI that is unmatchable by traditional system integration. (ACCA 2015) RPA enables quick wins because of the rapid implementation of automated processes (Grung-Olsen 2017). RPA can provide substantial ROI for business process owners and enterprises. RPA allows automation of manual processes in a cost-effective manner because RPA software costs are typically lower than traditional business applications. RPA can also leverage the existing IT infrastructure without impacting the live systems. (Javed et al. 2021 p. 5) In RPA project the focus should not only be in ROI but also in the business impact (Boulton 2019).

RPA should be implemented to increase business value for the organization. RPA should drive operational efficiency, productivity, quality, and customer satisfaction. (Accenture 2016) RPA can be used to generate multiple business benefits such as cost savings, improved customer experience and even employee satisfaction. Customer satisfaction can be improved with accelerated response time and employee satisfaction may be increased when they no longer must perform repetitive tasks. (Lacity & Willcocks 2016) RPA allows companies to follow regulatory compliance more accurately because all robot executions are tracked and processed in a standard way. Software robots do not make mistakes while copying and pasting information the same way humans would and they perform actions at a set time. Robots can be easily scaled for increased demand during peak times without losing accuracy in performance. (IRPA 2015)

RPA is an alternative to offshoring for big corporations. Offshoring has been used for decreasing operational costs by hiring employees from countries in cheaper countries. RPA allows total ownership of the process, and it is cheaper than offshoring. Scaling the solutions is also cheaper and faster once the process is automated with RPA. (IRPA 2015) RPA promises

that it costs 1/9 of outsourcing process to offshore workers and payback time of 6 to 12 months. (ACCA 2015)

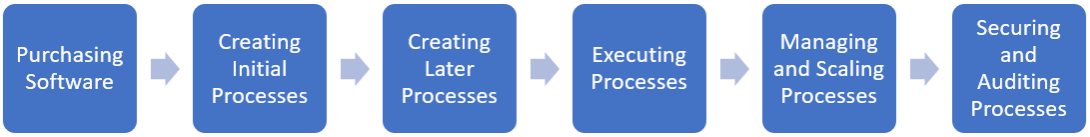

Figure 4 Components of RPA TCO (Adapted from Chappel 2018)

Figure 4 shows the six components of RPA TCO. The first two components Purchasing Software and Creating Initial Processes are the first costs that an organization will face at the start of the implementation process. Usually these are used for evaluating the total costs of RPA. The costs of later phases should be considered when evaluating the TCO because they greatly affect the costs over time. Creating later processes may be significantly cheaper than the initial processes if the groundwork for RPA implementation is done effectively. The costs of Executing Processes depend on the efficiency of the robots. When processes handle thousands of transactions, small differences in run times multiple and can affect the overall efficiency. A significant point affecting robot efficiency is the waiting time within processes and between different processes that the robot executes. (Chappel 2018)

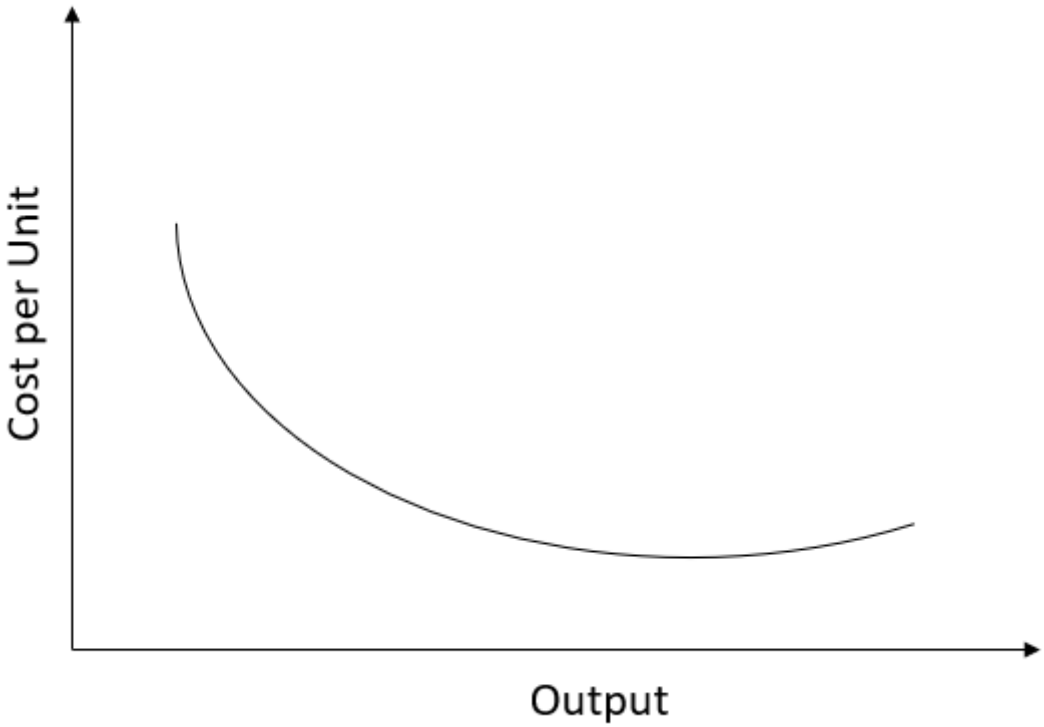

Figure 5 Economies of Scale (Adapted from Stigler 1958, p. 59)

Figure 5 presents economies of scale. As the output increases the cost per unit decreases to a certain point where the costs per unit start to increase again. The economies of scale can also be applied to RPA. The fixed costs associated with RPA start to decrease as the number of automations increase. The development costs of the automations also decrease as the component libraries. The number of automations in production increases the maintenance costs, and at some point, the robot capacity will fill up and there is a need to acquire a new robot that comes with new costs.

3 BUILDING RPA ROADMAP FOR ANORA

The empirical part of the thesis consists of four subheadings where case company is introduced, research design is explained, the research results are presented to the reader and analyzed. Based on the findings of the empirical research and literature review an RPA roadmap is built for the case company.

3.1 Anora introduction

Anora is a publicly traded company that produces, imports, exports and markets alcoholic beverages. The company operates across the Nordics with head office in Helsinki and offices in all the Nordic capitals. The company has distilleries in Finland and Sweden, bottling plants in Finland and Estonia, logistics facilities in Norway, and cognac production and aging facilities in France. Their most significant clients are the Nordic alcohol retail monopolies, international alcoholic beverages wholesalers, travel retailers, grocery stores and importers in export markets. They export alcoholic beverages to approximately 30 countries. (Anora 2022)

In addition to alcoholic beverages their business operations include industrial products and services. Anora Industrial offers barley starch, barley alcohol, technical ethanol and solvent, nature geothermal fluids and a broad range of contract manufacturing services. Anora Industrial offers these high-quality solutions and services for their industrial partners. (Anora Industrial 2022)

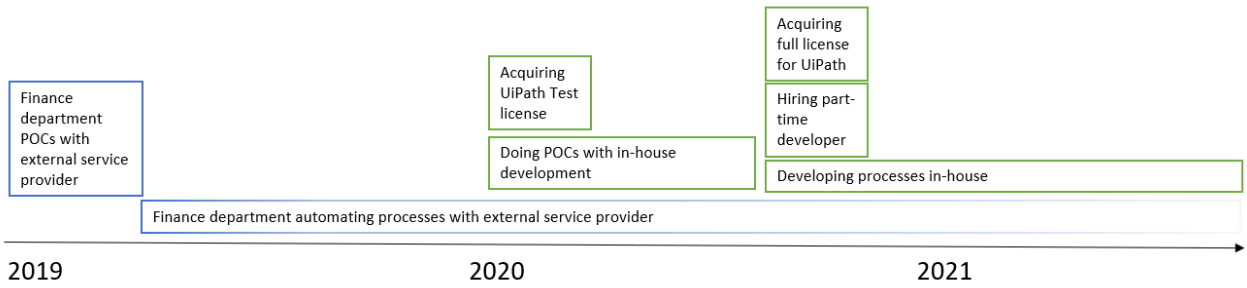

Figure 6 RPA steps in ex-Altia

The Figure 6 presents the RPA steps that have been taken at Altia before the merger. In 2019 Altia's financial department was facing a sudden increase in labor, partly because of sub optimally implementing new invoice processing system. They needed to hire more workforce or automate some of the processes. They used external consultant company that used robotic process automation to automate some of the tasks. The robot performed the tasks fast and the cost of the automation was not too high. Because of the initial success they decided to expand the use of RPA outside of the financial department. After using external company to automate more tasks they realized that the costs of automations increased rapidly, and the benefits were not growing at the same rate.

The RPA project in the financial department had sparked the interest for implementing RPA more widely. The company mapped possible use cases for robots and after realizing that there were a significant number of use cases. Since RPA development is significantly easier than traditional IT development, they decided to try in-house development. Otherwise Altia had outsourced almost all the development for their IT. In the spring of 2020 chose to use UiPath platform for developing RPA.

Altia made the first automations with a UiPath test license. These automations acted as PoC for the technology, and they were highly promising. In the fall 2020 Altia acquired a full license for UiPath and started developing more automations. They hired a part time RPA developer for automation development. Developing easy automations such as exporting reports from ERP system and emailing it proved easy to implement. Automating entire process with many different software, multiple exceptions and business rules proved to be rather difficult and time consuming.

The first automations were attended automations that ran on employee's desktop, and they automated simple tasks which did not need extensive error handling. The automations mainly gathered data from web pages or email attachments and updated data to ERP system or compared the gathered data to the data in ERP system and notified employee of any changes. After some time, there was a need to run unattended robots. The first iteration was a laptop that was in the office and its only purpose was to act as a desktop for the unattended robot. There was no need to make major changes to the automations that were transferred to the unattended

robot, but minor adjustments had to be made. In the spring of 2021 Altia acquired a VM for running the unattended automations.

The development for new automations was slow because there was lack of knowledge for RPA development and there were not enough resources that were appointed for developing new automations. The processes to be automated were not mapped with enough detail before starting the automation development. Because of this more complex process automations were created by iterating.

3.2 Research design

The empirical part of this thesis centered around semi-structured interviews that were conducted for Anora employees. Semi-structured interview is a type of qualitative interview that has research questions or a script that the researcher has prepared, but there is room for improvisation if needed (Myers & Newman 2007). Qualitive research answers how and why questions of a phenomenon in the context that it is situated in (Baxter & Jack 2006). As there is no one right answer for implementing RPA and the interviewees are experts in their own subject area the interviewees were given freedom to answer the interview questions freely and further questions were asked if necessary.

The interviews were conducted for Altia employees during April 2021. There were two different sets of questions, one for employees working in different business units and one for IT and development employees. The interviews for business employees aim to answer questions about expectations for RPA, automation potential in their tasks, the value that automations have produced, and difficulties and improvement ideas in the automation development process as well as citizen developer potential in the future. The governance questions are aimed at people in the IT and development departments. These interviews are done to better understand the needs of RPA governance in Altia and how RPA governance fits in with the current IT governance model. They also help with defining the configuring best practices inside the company for future citizen developers. The interview questions are in appendix 1 and 2.

The questions were sent to the interviewees in advance. The interviewees were also shown a short presentation just before the interview to refresh their memories of RPA fundamentals. The PowerPoint slides for the presentation are in appendix 3. The presentation was shown so that all the participants had the same understanding of RPA terminology and capabilities of current RPA solutions.

3.3 Results and Analysis

The business interviewees were chosen based on if they had an RPA process that was developed for a task in their job. There is a mix of tasks that were easy to implement to processes that took

a long time to implement. In the Table 2 is a list of the interviewees, their department, and main responsibilities. Three of the interviewees worked in customer service, two in procurement and two in finance.

Table 2 Business Interviewees

Job Title	Department	Responsibilities
Customer Service Coordinator	Customer Service Finland, CSF	Responsible for one of company's partners related customer service.
Customer Service Manager	Customer Service Finland, CSF	Managing the customer service team in Finland.
Procurement Planner	Procurement, PROC	Procuring components for the plant.
Procurement Manager	Procurement, PROC	Managing procurement team and responsible for the plant procurement
Finance Process Owner	Finance, FI	Handling payment transactions, sales ledger, credit control, and invoicing.
Director, Finance Operations	Finance, FI	Responsible for the financial administration.
Customer Service Team Leader	Customer Service Sweden, CSS	Managing the customer service team in Sweden. Make everything work in the systems with order handling and the logistics.

The employees in the finance department have two years of experience with RPA. They have developed automations with an external partner since 2019. The Finance Process Owner has been mapping the processes and defining the specifications for automations. The Director of Finance Operations has been involved in the RPA project as a manager.

The other business interviewees have been involved in one or two RPA projects. They have been mapping the process, provided specifications for the automations, and checked that the executions are correct.

Table 3 lists interviewees for the governance interviews. These people were chosen based on their involvement in RPA projects, relevant positions for implementing RPA and expertise in IT governance.

Table 3 Governance Interviewees

Job title	Responsibilities
Development Manager	Improving process quality. Often processed are improved via IT systems. Not part of the IT department but collaborates with them on projects.
CIO	Managing IT department and part of Executive Management Team (EMT). Responsible for the entire IT scope.
Solution Owner, Production	Responsible for IT systems in production and their development.
Service Manager, IT	Managing IT service and IT operations.

The Development Manager has studied and developed robots and the infrastructure for robots since spring 2020. They also have previous programming experience which has aided helped with robot development.

The CIO has experience with RPA from his previous job at a different company. The previous company developed RPA for HR and finance departments. In total they had 28 robots. The CIO was responsible for operational management of robots. When automated processes needed changes, the fixing took a long time which led to problems. Because of this they decided to outsource the continuous maintenance. Most of the development was also outsourced.

The Solution Owner has not developed or used RPA but has become familiar with the subject through case studies, RPA vendors, and RPA papers. He is familiar with the possibilities of the technology.

The Service Manager has been involved in RPA projects that use SAP. Her responsibility in projects has been advising with SAP and managing robot access rights.

3.3.1 Automated processes

Table 4 presents the processes that the business interviewees described in the interviews. The table includes the name of the process, a code for the department where the process was implemented and a brief description of the process. The department can be used to link the

process to the employees that were working in the department. The finance department had automated processes for two years and had in total 40-50 automated tasks. They have 5 main processes or themes, and these tasks are included in those themes. Because the department has so many automated processes one process was chosen for closer inspection.

Table 4 Processes

Process	Dept	Description
Sample Order Handling FI	CSF	Anora employees email customer service an excel form that is filled with the products that they want to order. The order is made to SAP based on the filled excel form.
Bulk Purchase Order Arrival Date Update	PROC	Downloading excel file from freight forwarder portal. Checks Purchase Order (PO) arrival date. Compares the Vendors arrival date to arrival date in SAP. If the Vendors arrival date is different it will update the date to SAP. A report is created from the data, and it is emailed to a procurement planner.
Purchase Order (PO) Report	PROC	Download report from SAP of Rajamäki POs, it checks POs that have errors (POs that are over a week old with no supplier confirmation date, POs with no price, and POs that have not arrived on time). Generates a report and emails it to procurement planners.
Reporting MAP Prices	FI	The robot checks the prices of components arriving next week. It also checks the price of the last three orders received of the same item and calculates the average price of these. If the arriving orders price for the component differs more than 5 % it is added to a report that is sent for the buyer of the component who can check if the price is correct.
Sample Order Handling SWE	CSS	Altia employees email customer service an excel form that is filled with the products that they want to order. The order is made to SAP based on the filled excel form.

Sample Order Handling FI

Sample orders are sent to customer service. These orders are in the form of an excel file that is a structured form shared on SharePoint. The customer service employees use CRM system to access these emails and the excel file in the attachment. They create orders to SAP based on the excel file and notify the orderer when the order is done.

The automation is done by giving the robot accounts to the CRM and SAP and access rights to the correct transactions and environments. Customer service assigns tickets with sample orders for the robot's CRM user. The robot checks tickets assigned to it and goes through them one by one. It downloads the attached excel file and opens SAP. In SAP it makes the order based on the attached excel file and replies to the order email when the order is completed. If there are any issues when completing the order in SAP, the robot stops execution of the ticket and sets the ticket status to "Waiting for Internal Action". Then the customer service checks the ticket manually.

Before the automation, the excel form for the sample orders had to be changed. The old form lacked information that the robot needed to make the order in SAP. Before automation the employees in customer service were able to deduce this from the other fields of the form. Otherwise, the process was left untouched. The only other change was that the tickets were assigned to the robot instead of a customer service employee.

The two employees that were mapping the process and giving specifications for the robot spent less than ten hours on the project. They said that the project had a clear goal from the beginning. This goal has not been reached. The process proved to be more complex than was initially thought, and the scope grew as the project went on.

There were some technical challenges with the automation such as CRM not responding causing the robot execution to fail, SAP environment changing causing the orders to be filled wrong, and items missing from the orders with many rows. The robot did not handle exceptions such as items being out of stock. These caused minor reworks, but they were fixed or some work around was developed for the process. The main issue was that the excel form was not filled in correctly, the old version of the file was used, or emailed in a wrong file format. Most

of the sample order forms were not filled in correctly. The robot could not handle these exceptions in the file and all the tickets with faulty excel files had to be handled manually. Customer service were using more time because they had to check if the attached form was correct before assigning it to the robot. The excel forms were often wrong even after reminders to use the most recent form and to fill it correctly.

The other employee thought that there were no problems in communication throughout the project, but the other noted that there were some problems. There was a gap between the RPA programmer's knowledge about the process and customer service employees' knowledge about the RPA technology. There were things self-evident for the customer service employees that the RPA programmer did not take into consideration. The RPA programmer also assumed some things about the process that turned out to be wrong.

Bulk Purchase Order Arrival Date Update

The freight forwarder for bulk wines has a web portal that has reports about the arrival dates of the containers. Someone from the procurement team would check this report and compare it to the arrival dates in the SAP. There were two ways of doing this either checking all the POs in the report from SAP or maintaining an excel file with the SAP arrival dates and comparing it to the report from the freight forwarder portal. The arrival dates from the report are then updated to SAP. This could take one to two hours.

The robot logs in to vendors web portal and downloads an excel file with all the relevant POs. It checks the arrival dates from the report and compares them to the SAP arrival dates and updates them if necessary. If there are POs with faulty PO numbers on the report these are added to a list of errors. Procurement planner is emailed a list where they can check all updated arrival dates and PO numbers that could not be handled by the robot.

The process was first run on a procurement planner's laptop with an attended robot. The execution took about 10 minutes in total, and the laptop could not be used when the robot was running the process. After ex-Altia got their virtual environment up and running the process was moved to run on the VM by an unattended robot.

The two employees that were interviewed from the procurement team were in a couple of meetings for this project and spent a few hours. The project had a clear scope and objective. There were no challenges in communication and the objective was met after a couple of iterations. There was no need to make any changes to the process. There have not been any wrong executions or errors in the automated process, but there have been added features to the original process. The RPA programmer was also part of the procurement team which meant that the process did not need to be mapped as thoroughly, because the process was well-known.

The automation has helped the procurement team in their job. Updating the arrival dates was laborious and time consuming. It was done once a week or once a fortnight, which meant that the arrival dates in SAP were often not up to date. Production planning is done based on the arrival dates of these containers and different components are bought based on that production plan. Now the arrival dates can be updated daily. The only drawback is that the procurement planner loses some of the control over updating the arrival dates and needs to check the report generated by the robot. However, the report generated by the robot

Purchase Order Report

Before automating the procurement manager went to SAP to download a report about POs to the plant. They would then modify the file in excel to highlight POs with exceptions such as POs with no supplier confirmation, items that are missing a price, and POs that have not arrived or are confirmed to be delivered in the past. Slicers are added to the excel to separate POs to purchase groups before it is emailed to procurement team, who can check the POs. This was done once a week and it took about half an hour.

The automation works on one of the procurement planner's computers as an attended robot. Downloads the report from SAP, invokes VBA script to modify the file and emails it to the procurement team. Bulk of the development time was spent on developing the VBA script. There was no need to make any changes to the process and the robot executes the process in under a minute.

The automation saves the time that the procurement manager would have used for making the report, but more importantly the report is generated more often. This ensures that the data in SAP is more up to date and errors can be corrected before receiving the items.

There were not any problems in the development process and the development was done in a few iterations. There has not been any wrong executions or errors in the executions. The development was quick, and it took less than a week of work. The RPA programmer had done the report before which reduced the need for detailed process mapping.

Reporting Moving Average Prices

Before automation the finance department used an SAP report that showed the components that had been received at a different price than before. These prices would be fixed for the PO, but sometimes the prices were wrong on the PO and needed to be corrected. The component prices were used for calculating the moving average price (MAP). The problem was that fixing the prices after they had been received took more time than if the prices were fixed before receiving them in SAP.

The robot checks POs that are arriving during the next week. It checks all the components on the PO and their prices. Then it checks the components price for the last three received POs. If the new price differs more than 5 % from the average price of the three last POs it is included on a list. This list is sent to the purchaser of the component who can check if the price should be fixed. The purchaser is responsible for fixing the incorrect prices.

Because the automation differs from what was previously done a completely new process had to be developed. Before automation the people involved needed to figure out how to calculate the price difference correctly and how the generated report should look like. They also needed to get the email address for the purchaser of the component.

The Finance Process Owner estimates that they spent Around 10 to 15 hours on the project. There have been 5 or 6 people from ex-Altia side involved in the projects from the financial department.

The automation has worked as intended and there have not been any major incorrect executions. Because the process is completely new, and it does not replace human labor directly, it is difficult to estimate the time that it saves. The prices should be more accurate and rework time of correcting prices on received POs has probably decreased. Because the fixing of the prices is the responsibility of the purchaser all the prices are still not fixed on time and there is still a need to manually fix the MAP prices after the goods have been received.

Sample Order Handling SWE

The process is similar as the Sample Order Handling in Finland. There are differences in the Excel form and the way the order is completed in SAP. The process was automated after the Finnish process, so the components for logging in SAP and CRM could be used.

Someone from the company sends an email to customer service if they want to have product samples. They fill in an Excel form with the information of the products they want to order. This Excel form is as an attachment in the email. Customer service employees use CRM to access this attachment and complete the order in SAP. After they have completed the ticket, they reply to the email and mark the CRM ticket as completed.

The automation works in a similar way as in Finland. Customer service employees as CRM tickets with sample orders for the robot's user in CRM. The robot checks the tickets assigned to it and completes the orders based on the Excel form. The robot replies to the email when the order is completed and marks the ticket as completed. Compared to the automation made for Finnish customer service the robot is able to handle more exceptions in SAP such as items that are out of stock or items that have pop-up windows that appear when the item is added to order.

Swedish customer service receives 20 – 50 sample orders in a week, but the number of tickets fluctuates. Last year the total number of tickets was 2900, which averages 56 tickets in a week. Each ticket takes about 5 minutes to complete. The weekly time saved by automating the process varies from 1,5 hours to over 5 hours. The customer service employees can focus on other tasks. One of the employees will be leaving customer service during this year and their tasks are distributed to other employees which means that they need to free time from their current tasks. The Excel form includes fields where special instructions for the order can be

inserted. Sometimes the customer employees forgot to include these instructions to the order in SAP, which led to the wrong item being delivered. The robot does not miss these if they are included in the Excel file.

The robot has performed all assigned tickets correctly in SAP. There have been some issues with the CRM not responding, but these have been fixed by restarting the process. The Excel forms, except for a few, have been filled in correctly.

At the beginning of the automation project the customer service manager was not familiar with RPA, which meant that he did not understand what was required level of mapping the process and its exceptions. During the project he gained more understanding of the technology and could determine all the necessary process steps and exceptions. There were weekly meetings where progress of the development and challenges that had arisen were discussed.

The project had a clear goal of automating the sample order handling of customer service. The automation has been completed and has been running in a production environment. It is in hypercare phase, where it is monitored closely, and small tweaks have been made to make it run more reliably. There have not been any incorrect executions. After the hypercare phase it can be scheduled to run daily.

3.3.2 Total Value of Owning RPA solutions

One of the reasons for Altia starting to develop automations was the rising costs of solutions as they tried to scale automations. The in-house development of solutions was chosen because it decreases the development costs of projects.

The infrastructure and licenses are common for all projects. The ballpark figures used in this thesis are:

1. The Virtual Machine: 3000 €/a
2. Developer licenses: 9000 €/a
3. The Unattended robot + Orchestrator license: 10 000 €/a

The total costs in a year are 22000 €. These costs can be divided equally for all projects. More accurate would be dividing the robot license and virtual machine costs by the execution times of automations. Since all the in-house developed automations work rather fast and there is no shortage of time in the virtual machine, it is at this point irrelevant. The formula for calculating the allocation for a project is presented in equation 1.

$$Costs\ per\ automation = \frac{VM + Developer\ licenses + Robot\ and\ Orchestrator}{Number\ of\ Automations} \tag{1}$$

The costs stay the same as long as the resources are sufficient. The limiting factors for the VM and the robot is time as most processes cannot run in parallel. As the unattended automations need no human intervention the executions can run around the clock.

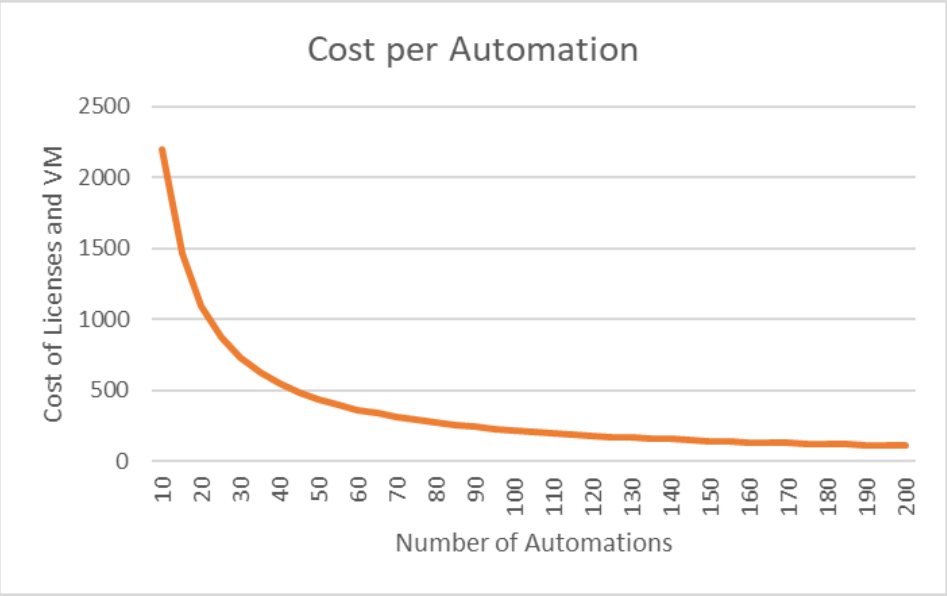

Figure 7 Cost per Automation

Figure 7 shows that the license and VM costs per automation decrease as the number of automations increases. Currently the number of automations in production is 15 which means that the cost per automation the example prices is 1467 €/a. The cost per automation decreases rapidly when adding new automations in the beginning and then it steadily decreases. However, because most processes cannot run in parallel there will be a need for another VM and robot

when the robot reaches full capacity. The number of possible processes running on a single robot depends on the length of executions and how many times in a day each process is executed. Theoretically the processes can be set to run one after each other around the clock, but the unreliability of RPA causes a need for debugging in case there are failures with the processes. There may also be a need to run particular processes at the end or beginning of the month which leads to peaks and temporarily running out of capacity.

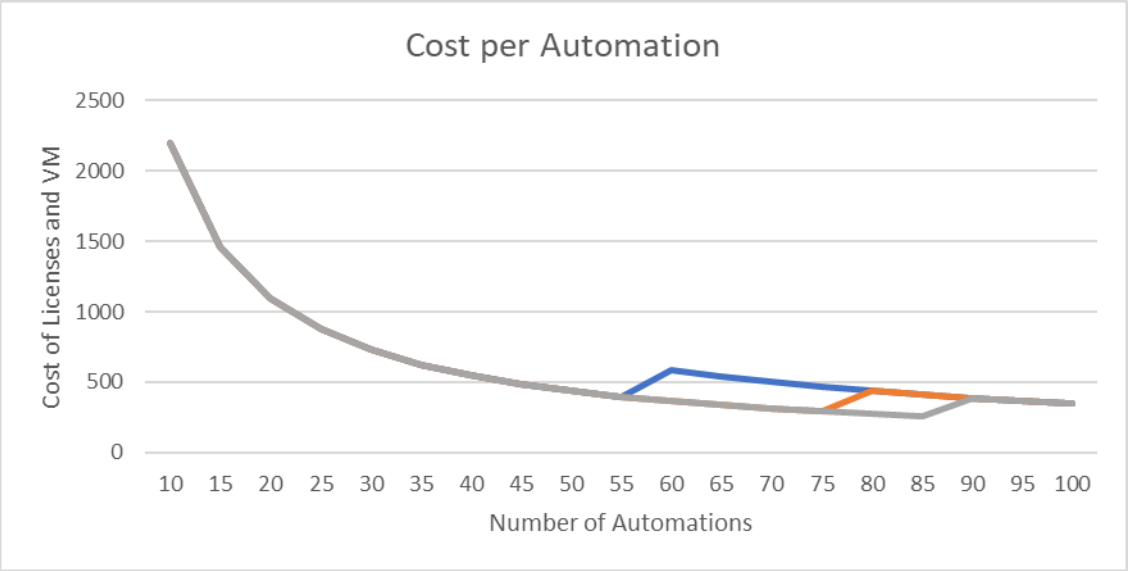

Figure 8 Cost per Automation with added robot

Figure 8 shows the spike in costs if another robot is added. The orange line shows the 2nd robot added at 60 processes, blue 80 and grey 90 processes. The steepest reduction in costs is at the beginning when adding new automations and the second robot does not significantly increase the license and VM costs.

The costs of VM and licenses can also be compared to the saved working hours. Then the robot gets an hourly cost that can be compared to the cost of performing manual work. The formula for calculating the hourly cost of a saved hour is presented in equation 2.

$$Cost\ of\ saved\ hour = \frac{VM + Developer\ licenses + Robot\ and\ Orchestrator}{Sum\ of\ Saved\ Hours} \quad (2)$$

This is more useful when comparing the work performed by the robot to manual labor. The problem when calculating this cost is evaluating the saved working hours. Most tasks that are performed by employees have not been timed accurately and the time to perform tasks depends on different cases and also the employee that is performing the task. This means that accurately tracking the hours that the automation has saved which in turn affects the above calculation.

The costs of monitoring, maintenance and governance of automations should also be included in the total costs of ownership. There is no data for these costs because the RPA maturity is still low, and the developers of automations are also monitoring the automations in production. As the number of automations increases monitoring and maintenance will be necessary, but it will probably not require extra resources as the automations will free up time from the business units.

There are also costs that can be directly allocated to a project. These costs depend on the complexity of the automation, how well the process is defined, and the skills of the developer. The project costs include:

1. Mapping the process
2. Developing the robot
3. Testing the automation

When the development is in-house the costs must be calculated from the time that each activity takes. Equation 3 presents the project costs. Here we can assume that the hourly rate for each activity is 30 €/hour. The mapping of the project usually involves at least a process expert and the developer. The development can be done by the developer and the testing can be done by the developer, the process expert, or both. The direct project costs can be calculated by calculating the time that employees have spent on the project and multiplying this with the hourly rate.

$$Project\ costs = (Mapping\ the \text{ process (t) * No of employees + Developing the robot (t) + Testing the automation (t))} \text{ * The rate of internal labor (€/t)} \quad (3)$$

The clear benefit is the time that the automation saves. This can be translated to monetary benefits by calculating the costs of doing the tasks manually. The hourly rate for manual work can be set for 30 €/hour, which would include more than just the salary of the employee, such as indirect costs. We can calculate the benefits as hours saved and turn that into financial value by using the hourly rate. The employees will have less tasks to perform, but the full benefits can be achieved when employees are restructured to perform the remaining tasks.

These benefits and costs can be easily calculated and proven. However, the rest of the benefits are more difficult to quantify. The efficiency of employees has not been mapped thoroughly before the automations. It can however be proven easily that the automations perform the tasks faster. There also is no data about the regulatory compliance of any of these processes, which would suggest that at least the minimum requirements are met.

Table 5 shows the lessons learned from each of the automated processes. These lessons should be considered when choosing, mapping and developing new processes for automation with RPA. The first Sample Order Handling taught that the scope of the automation must be clear from the beginning of the project and the process must be thoroughly mapped before automating it. These lessons could be used when developing the Sample Order Handling for Sweden Customer Service. It was also the first automation that used premade components, which decreased the development time significantly. The comparison between the Sample Order Handling FI and Sample Order Handling SWE is interesting since the process is very similar in both countries but the automations yielded different results. The Finnish process is slightly more complicated, but the main issue was with the actual order form being filled incorrectly. There was significantly less problems with the order form in Swedish customer service. The order form was simpler in Sweden but the reason for less problems may have been also because of better communication with sales representatives. The automated report and updating of arrival dates allowed to have more up-to-date data in the ERP system and in the reports, because they can be done more often. Reporting of the MAP prices proves that RPA can also be used to create new processes instead of just automating the current processes.

Table 5 Lessons learned from automated processes

Process	Lessons learned
Sample Order Handling FI	Mapping the process before the automation is essential. Have a clear scope.
Bulk Purchase Order Arrival Date Update	If the developer is already familiar with the process the development is easier
Purchase Order Report	Automating reports allows for increasing the reporting interval
Reporting MAP Prices	RPA enables new processes.
Sample Order Handling SWE	Reusing components significantly decreases the development time.

Table 6 shows the benefits and drawbacks of the automations based on the interviews. The time that was saved is interviewees' estimation of the time the task took manually to perform, and the yearly savings are calculated by the rate of internal labor. Some of the automations are run more often now that the process is automated than when the process was done manually. This can increase the perceived value of automation more than the calculated yearly savings. The project costs are for in-house developed automations with the formula of Project costs which was presented previously. A notable finding for these is that the project costs of Sample Order Handling SWE are almost 30 % lower than Sample Order Handling FI which was developed first and unsuccessfully implemented. The Swedish version also has more features for error and exception handling.

Table 6 Benefits and drawbacks of automations

Process	Benefits	Projects costs	Drawbacks
Sample Order Handling FI	No realized direct benefits from automation Components for future automations	Mapping, Developing, Testing: 3150 €	Wrong executions, manual rework Multiple iterations in development which lead to long development time.

Bulk Purchase Order Arrival Date Update	Time saved: 1,5 h/week Yearly saving: 2340 € No mistakes More up to date data	Mapping, Developing, Testing: 1575 €	Procurement planner has less control and oversight.
Purchase Order Report	Time saved: 0,5 h/week Yearly saving: 780 € Can be run more often	Mapping, Developing, Testing: 900 €	No drawbacks
Reporting MAP Prices	Time saved: N/A Less rework time in finance department More accurate prices	Mapping, Developing, Testing: N/A	No drawbacks
Sample Order Handling SWE	Time saved: 3,5 h/week Yearly saving: 5460 € More accuracy Greater employee value	Mapping, Developing, Testing: 2250 €	No drawbacks

3.3.3 Governance

All the governance interviewees agreed that RPA governance can be implemented with other IT governance at Altia. The governance might be brought more towards business, but IT control was considered an important factor. RPA differs from other IT development because currently it is developed in-house, but this was not seen as a problem, because all major automations should follow current change management through change advisory board. The CIO noted that current IT governance requires some fine tuning with indicators for automation reliability and the time to develop automation to measure the business cases. The Solution Owner saw that the biggest problem with building the governance model is low RPA maturity and that as the maturity grows the governance model will adapt. He also noted that there will be new positions in business as robot managers become common. The service manager noted that RPA governance will need access management for the robots in SAP and other systems they use.

The interviewees all mentioned that the governance with RPA is more closely related to business than traditional IT governance but otherwise it does not differ that much from the governance model that is currently deployed. Centralized control for selecting processes to be developed was mentioned directly in three out of the four interviews and it was implied in the last one. The governance for RPA was thought to be a mix of IT controls and business controls. The Service Manager said that business control would cover errors in automations and how to recover from the errors and IT would cover access controls for applications and the infrastructure that the automations used. The Solution Owner also noted the need to manage and maintain the infrastructure to enable the automations to run reliably. He also noted the need to manage the development to know who will be developing the robots, where the ideas will come and how the ideas are evaluated, and how to handle changes in processes and underlying applications. The monitoring and maintenance were mentioned in all interviews and the monitoring was considered responsibility of the business units that have the automation. The maintenance divided opinions whether it is responsibility of business or IT.

Logging and Testing

In the governance interviews everyone noted that the logging and testing that needs to be done before putting automation to production depends on the type of process to be automated. All of the interviewees agreed that logging is more important in unattended automations than in attended automations. The Development Manager noted that even if attended automation runs on users' desktop the executions can be so fast that it is hard to follow and requires some logging. The most important loggings that came up in the interviews were errors and changes made to documents. Based on just the logs it was seen important that employees can check what the robot has done, and fix errors made during the execution. The robot must also leave an audit trail for all the executions.

For testing the automations, the most important aspect was that the executions were correct and that the robots create the same output as employees. The executions should be done with test cases and the inputs and outputs must be checked carefully. Common errors should be observed and processing in case of failure should be developed. The required testing depends on whether the automation creates a report based on existing data or updates data to an IT system. According to the Solution Owner the extent of testing required should be based on the

automation and testing requirements must be decided at the beginning of the project. When automations are first run in the production environment there should be hypercare phase where the executions are monitored carefully. For attended non-business-critical automations the testing can be done while running it in production environment. The Service Manager remarked that the testing should be done with the accounts that will be used in development to notice that the robot has access to all necessary applications. If the robot performs high volume actions, it must be tested that the automation does not affect the performance of the applications it uses.

The Development Manager mentioned that for Citizen Developers the requirements for testing depend on the process that is automated. Processes that update information to SAP should be tested by CoE. Processes developed by less experienced citizen developers should be tested and reviewed by more experienced developers. For small automations there is no need to perform extensive testing, because RPA operates on top of already tested applications.

Risks

All the responses in RPA risks included incorrect executions. If automation testing and monitoring is not thorough enough the risk of incorrect executions increases as automations are scaled to cover more processes. Because the robot executes the processes in the same way each time a flaw in the process is performed in each execution. The conclusions of wrong executions are more significant if the automation performs data input. Wrong inputs can cause rework or even business consequences. The risk of bad automations increases if people with little experience can develop their own automations. The risk of updating wrong data to systems can be mitigated with extensive testing, logging, and monitoring.

Being too reliant on automations was identified in 3/4 of the governance interviews. If the automations cover a significant portion of any teams' tasks, and the employees are reallocated to new tasks, the automated processes become business critical. Failed processes will cause manual labor that will need extra resources. Mapping the processes thoroughly before automation helps the automation development, but also leaves clear instructions for manually performing the tasks. Business critical automations should be built more robustly than less critical automations. In automation mapping, development, and testing phases it is important to identify parts of the automation where failure may occur.

Resistance to change to change was identified as a risk on half of the governance interviews. Communication of the RPA implementation was seen as an important aspect of the implementation. Employees must be aware of the RPA project, but it must be ensured that they do not see it as negative progress. The CIO also mentioned other personnel risks, there are only a few employees in the company with knowledge about the RPA projects and expertise on the technology. It is important to expand the employee capabilities to lessen the personnel risk and to scale the use of RPA across the organization.

The virtual environment was seen as risk or at the very least a matter that needed consideration. The unattended automations run on VM, and the reliability of automations is irrelevant if the environment fails. The environment must be controlled from reliability and security standpoints. Because RPA works on top of existing applications the reliability also depends on these underlying applications, and the robots access rights must be managed in all applications that are used in automations. The robot should not have access to applications that the robot manager does not have rights.

One of the interviewees raised concern about the RPA software vendor as well as using external partner for automation development. The concern for RPA vendor stems from old news about UiPath's accounting errors where their own software may have been used. The CIO's main concern with using external partners for automation development was vendor lock. The Development Manager also noted that the process ownership must be kept in-house even if the automation development was outsourced.

3.3.4 Future Expectations

All people in the business interviews expect RPA to help them in their jobs by automating routine laborious tasks. Many employees noted that many of their jobs require decision making which limits how much automation potential there is in their tasks. The Director of Finance Operations noted that many of their teams' tasks would require AI to be completed. She believes that in the future RPA will gather information and present it to an employee who will make the final decision. The Customer Service Team Leader believes RPA will make their team more

efficient when routine processes are automated. If RPA will cover two more of their processes, they can save one FTE.

The governance interviewees had also noted the automation of tedious tasks, but their answers differed more from each other. The Development Manager believed that RPA together with process improvements could reduce working time by 30 – 40 % for office workers. This would require citizen developers and shift to mindset for all employees to automate first. He also believes that RPA enables business cases that were previously too expensive to complete with system integrations. The CIO expects that there will be a way of determining the best business cases for RPA and that the maintenance and development can be done cost-effectively. He also hopes that the solutions can scale if the geographical scope increases. The Solution Owner expected RPA to evolve to hyper automation, where RPA is just one part of ensemble of solutions that include system integration and machine learning for example. He believes that in the future employees will have personal bots and humans and computers will work together. He also thinks that there are two different possible routes for RPA development; either as traditional IT investment which will save money, or as tool to help employees be more efficient in their jobs. The second option would require citizen developers that automate jobs for their teams and in the future employees automating their own tasks. The Service Manager also added that RPA can be a tool to improve user experience when employees can automate tedious parts of tasks that use legacy systems.

Citizen Developers

All the business interviewees were ready to learn RPA configuration. The enthusiasm differed from; it would be nice to understand, to willingness to automate team's tasks. The Director of Finance Operators noted that understanding RPA would decrease the resistance to change. Even though all employees were ready to learn RPA configuration most were concerned whether they have enough time to learn the skills and were worried that robot configuration would increase their workload. The Customer Service Team Leader noted that he would not want to be the one responsible for RPA automations because they do not have the human resources for creating these automations. All the employees expect thorough guidance for robot development. Two of the business interviewees had some programming experience, two had done excel macros and the rest had no experience with programming.

The robot governance was not as well received as the idea of configuring the robots. The business interviewees agreed that their responsibility would be checking that the executions run on time and produce the correct execution, but the real governance should be IT responsibility. The main concern for governance was also the increase in workload. The Finance Process Owner was responsible for managing 5-10 automations and checking that they execute correctly. He said that if the number of automations increases dramatically it would increase his workload, but currently the managing is not too time consuming. If there are errors in the execution, he messages the external RPA service provider who is responsible for fixing the errors.

3.4 2-year RPA Roadmap

In this chapter a roadmap is developed for the case company Anora. The roadmap gathers insights from actions that have already been performed, the theory part of this thesis and the interviews.

Anora has already started their RPA journey in the ex-Altia side. They started by necessity in the finance department when their workload grew, and they did not want to hire extra personnel. The finance department used an external service provider to handle the automations. Altia was responsible for discovering the processes to be automated, but the development, testing, maintenance, and orchestration of automations was outsourced. After the finance department had used a robot to lessen their workload for some time, Altia wanted to expand the use of RPA to other departments. The use of external service provider would lead to costly scaling of RPA, which lead to Altia choosing in-house development.

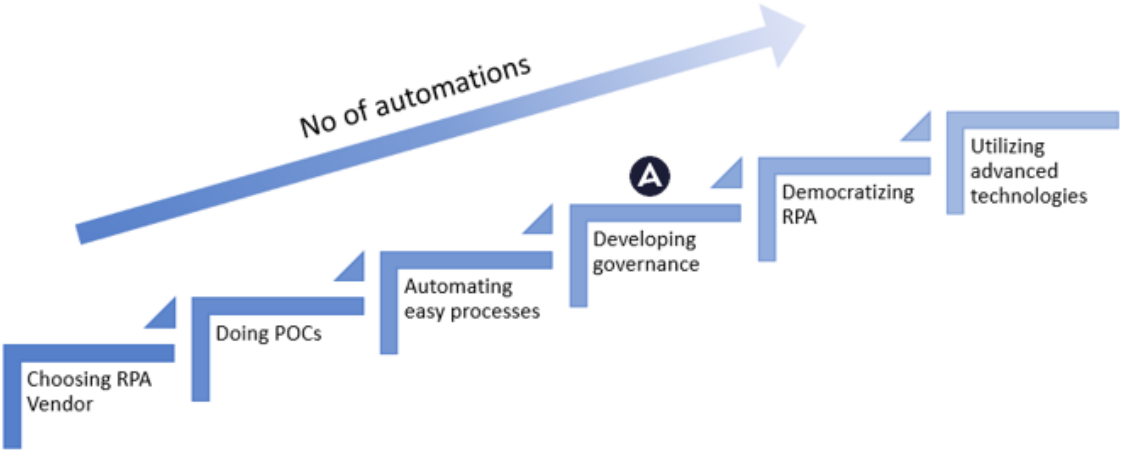

Figure 9 RPA implementation steps

Figure 9 shows the necessary steps for Anora to take in their RPA implementation and the Anora logo shows the step where the company is currently. The first three steps must be taken in the order presented in the figure and governance should be evolving during the implementation. The last two steps can be taken in different order, or simultaneously to each other. Developing the governance should not be overlooked because it provides the foundation for democratization RPA, scaling the automation solutions, and building the automation platform for intelligent automations.

The implementation starts by choosing the RPA Vendor, doing POCs and then automating the easy processes which have good benefits. Anora has already taken these first steps in the ex-Altia side. As they automate more processes it becomes vital to develop robust governance around the RPA. In the theory part of the thesis, it was recognized that developing governance for RPA was key factor for scalable and robust RPA implementation. The urge to have good governance for RPA that fits together with current IT governance was also seen as one key factor for RPA implementation in the interviews.

The CoE is responsible for developing the governance and driving the implementation of RPA. The CoE should be built early in the process to harmonize the development across the entire organization. At Anora there has been a named CoE with employees from IT and business, but the responsibilities were not entirely clear. The developers have worked on the automation

projects all the way from mapping the process to developing and testing the automations and have also been responsible for maintaining the automations. Since the implementation has been at an early stage there have not been any issues, but as the number of automations and the workload of CoE increases, the role of CoE must be defined. Harmonizing the development from mapping the process all the way to putting the automations to development becomes more important as Anora democratizes RPA, and the number of inexperienced developers increases. Wrong executions when updating data to different applications was seen as a major risk in the governance interviews and inexperienced developers were specifically pointed out. To mitigate this the developers should use the BPMN to map processes before development, there should be necessary logs in automations to ensure audit trail, and the CoE should perform checks during the development and testing. Especially the unattended automations should be tested thoroughly before they can be scheduled to run on the VM.

RPA should only be one tool that Anora can use for automation. The CoE should evaluate the proposed processes and whether RPA is the solution for the problem. Processes that are unnecessarily complicated should be made lean before automating. For business critical high-frequency cases traditional process automation with back-end integrations might be a better solution.

After developing the governance model for RPA, they need to democratize RPA by increasing the RPA capabilities in business units. The governance allows freedom for business units to try implementing automations to their own work within the rules set by the CoE. The democratizing of RPA allows business units to drive the automations in their own responsibility areas. This can mean discovering processes to be automated or even automating their own processes with citizen developers. Centralized development can still be used as the main driver for automation development, but at least the process discovery should be moved towards the business units, because they have the best knowledge of the best tasks to be automated. Business units automating their own tasks is simpler than centralized development because there is no need to map the process in detail as the developer knows the process thoroughly. The downside is that they need to learn RPA development which can take some time and effort and increase the risk of wrong executions. Citizen developers allow smaller tasks to be beneficial to

automate. In Figure 1 the RPA candidates would expand even further to the sector that was work that could only be done by humans previously.

Figure 9 the step at the top of the staircase is utilizing advanced technologies. It allows for more complex processes to be automated, but it increases the complexity of solutions and the expertise needed for developing the solutions. RPA should be used as a platform for these advanced technologies and the technologies added to that platform should be individually evaluated with POCs and business case calculations.

The RPA steps can be taken in an asynchronous fashion across the organization. The business units that were the first to do POCs with RPA will pave the way for other units. When automating processes for new business units or geographical locations, the implementation should start with the second step and show the new employees involved the capabilities of the technology by doing simple automations. Getting the employees excited for the technology makes it easier to democratize RPA. The new business units benefit from the governance, component libraries, and acquired skills that have already been developed.

Figure 10 Anora operations (Anora, 2022)

Figure 10 presents Anora operations on a map. Most operations are located in Finland and Norway, but there are also major operations in Estonia and Sweden. In the early stages it is important to focus on the geographical expansion to these countries because most RPA benefits can be reaped from these countries. Individual projects can also be carried out in other countries, but most resources should be centered around Finland, Sweden, and Norway. If there are similar processes used in other countries the development should be fast with the component libraries created in the top three countries.

The CoE should have employees from Finland, Sweden, and Norway. This reduces the resistance to change and ensures that the employees in each country feel that they have representation in CoE. Local members of CoE also know the business processes of each country

better and have better relationships with key employees in different business units. Having centralized CoE for all the countries allows efficient use of component library and harmonizing the choosing, prioritizing, mapping, developing, and testing of processes. Especially beneficial is automating the same process in different geographical locations. These benefits have already been realized when the sample order handling was automated in Sweden after the automation had already been developed in Finland.

Throughout increasing the number of automations, it is important to track the costs and benefits of the automations and constantly push for more accurate TVO estimates. Ignoring the hidden benefits and costs that are not accounted for in traditional TCO and benefits calculations may lead to wrong assumptions and lead to incorrect decision-making as the RPA implementation progresses.

Currently the benefits of RPA automations are calculated by evaluating the time that pre-automated process took and that is multiplied by the cost of internal labor. The difficulty with this calculation is evaluating the time it took to manually perform a process because it depends on the employee performing the process and complexity of individual case.

The hours saved do not automatically translate to monetary value if there are no changes made in the organization. These calculations should be used to demonstrate that the RPA implementation saves costs as more processes are automated. To prove that the automations save costs the current tasks should be able to be performed by fewer employees or the employees should be able to do more tasks. The actual benefits of automations may be much greater if the company can avoid hiring extra personnel in case there is an increase in tasks, or the current employees can be relocated to other functions. These results can be tested on a small scale by automating many tasks of a team and estimating the productivity increase of employees.

The direct costs of RPA can be easily calculated because they consist of ‘fixed’ costs: license costs and VM costs, as well as the project costs for individual projects. These costs can be divided to automations in production which allows calculation of yearly costs per automation. Figure 7 shows that these costs rapidly decrease as the number of automations in production

increases. In the early stages of implementation, it is also important to not only focus on decreasing the costs per automation but also building robust automations and developing the component library to make automation development and maintenance easier in the future.

As the company scales the automations the individual development projects should become easier and faster. This is achieved with the component library and increased skill in choosing, mapping, and developing processes. The license and VM costs will also be divided between more automations, which leads to fewer costs for individual automations as seen in Figure 7. The development times should decrease if component libraries can be used for new processes, however the easiest processes are probably automated first which will cause the future processes to be more difficult to automate.

After tedious tasks have been automated by RPA, employees have more time for tasks that require cognitive decision-making, there should be an endeavor to enhance employee value. Employees should be able to focus better on the more complicated tasks that are left as their responsibility, which can lead to superior results.

4 CONCLUSIONS AND DISCUSSION

RPA allows companies to automate manual routine tasks performed on computers. The robots can be viewed as digital workforce that works faster, more accurately, and more tirelessly than employees but only perform tasks where decision-making is not necessary. This allows for dividing tasks between employees and robots where each performs tasks that they are better at: robots handling routine data-intensive tasks and employees are left with cognitive tasks and interacting with other humans.

Developing RPA processes is significantly easier, faster, and cheaper than traditional process automation. This allows business to drive the RPA implementation in an organization and automating processes that were previously not profitable. The downside of RPA automations is the dependence on underlying applications and GUI of those applications. It makes the development easier but makes the solutions more prone to fail and there will be a need to update the automations in case the underlying applications change.

To efficiently implement RPA organization needs centralized control. RPA Center of Excellence is responsible for ensuring that RPA is a strategic initiative and best practices are followed across the entire organization when processes are automated. RPA implementation is often driven by business but not including the IT department has caused issues for many organizations implementing RPA. When automating business critical processes there needs to be governance in place and often IT is most capable of setting up governance that ensures that RPA follows organization’s requirements for security, scalability, auditability, and change management.

RPA allows for quick wins when automating processes because the development is fast but solely focusing on quick wins can cause problems further on the implementation. Strategically implementing RPA enables more value for business and less costs when maintaining and scaling RPA. TVO accounts for total costs, expected business and strategic returns which can have a significant impact on the profitability of RPA implementation.

4.1 Answering the Research Questions

This thesis focused on implementing RPA in case company Anora and it consists of literature review and empirical study. These research questions were formed to find a way to successfully implement RPA at Anora and find generalized matters to consider when implementing RPA.

1. *What resources are required to efficiently automate and govern processes with Robotic Process Automation?*

The required resources are divided into three categories: human, technological, and intellectual. The human resources required are centered around the CoE. There is a need to build a CoE that is responsible for driving the implementation of RPA and is responsible for building the governance for the RPA. The CoE should be built so that it includes people from business, IT, and high-ranking executives. The cross functional CoE with high-level support drives strategical change in the company. If a company wants to do RPA development in-house, they will need a RPA developer or a development team, but the development can also be outsourced partly or entirely. The roles of CoE can be added to current employees' responsibilities except for the centralized development, that needs to be outsourced or an internal developer is required. As RPA is democratized the citizen developers, employees automating their own tasks, can get more development responsibility. The role of centralized development is more substantial in the earlier stages of RPA implementation, because the citizen developers have not yet acquired the necessary skills for RPA development and the development would stagnate in the beginning.

The technological resources that are needed for RPA implementation depend on the sourcing option that a company chooses. To create automations there is a need for automation tool, environment for automations and a way to manage automations. These can be fully outsourced, done in-house or a mix between the two. The environment where the robots are run depends on the type of robots that an organization has. Attended robots can run on employees' computers, but unattended robots need a virtual machine to run independently on schedule or based on a trigger event. The robots that run on employees' computers can be mainly used for automating

small tasks because many automations may prevent the use of the computer while the automation is running. Because RPA mainly uses the GUI of applications there should not be any need for changes in current systems that the organization has. It is however necessary to ensure that the applications that the robots are supposed to use are compliant with RPA. The major drawback with RPA is also the fact that it uses GUI, if there are changes made for the underlying applications there is also a need to change the automations that are already in production. RPA can also be considered as a platform that enables other technologies to be used and allows for more complex automations to be developed. Advanced technologies such as ML, chatbots, and OCR can be used alongside RPA to increase the variety of tasks that can be automated. These additional technologies are added on top of the technology stack that is needed for RPA implementation.

RPA implementation requires intellectual resources from the organization and especially the employees in CoE. These are skills related to governing RPA, identifying processes to be automated, mapping the processes and developing the automations. The governance of RPA and identifying the processes to be automated should be mostly in-house because it allows for quicker implementation. The management of robots, mapping, and development of automations can be fully outsourced. The governance of RPA is similar to normal IT governance. If the organization that is implementing has functional IT governance RPA governance can be added to that. Organizations need to develop a pipeline for putting automations to production if they have no experience for developing their own IT solutions and handling exceptions that are encountered when automations are running. There should be initiative to have the skills of choosing and mapping the processes to be developed spread as wide as possible in the organization as possible. This allows the business units and even business teams to lead their RPA implementation. This will speed up the identifying of processes to be automated, because the business units have the best visions of which processes should be automated first. If the RPA development is done inhouse it is one of the most significant intellectual resources that is needed for RPA implementation. Organization should start with centralized development where a developer or a development team, depending on the size of the organization, develops the automations that are approved for automation by CoE. Because RPA development is significantly easier than traditional process automation the development can also be

democratized to citizen developers, who develop automations to help their own or their team's work.

2. *What value does Robotic Process Automation provide?*

RPA allows for quick wins since the development of automation is significantly faster than traditional process automation. RPA enables cost saving by replacing manual labor with robots performing tasks. The simplest way to calculate the cost-savings is to calculate the hours of work that automations save and multiply the time with internal hourly rate for labor. However, that value is only really realized once the workforce is reorganized, or the organization can avoid hiring additional employees as the workload increases.

The total costs come from project costs for each automation and the resources required for building, running, and maintaining automations. The project costs can be calculated by multiplying the employees hourly wage by the time they have spent on the project activities. These activities include mapping the process before automating, developing the solution, and testing the automation. The project costs for the case company were calculated with the formula 3 presented earlier and also below.

$$Project\ costs = (Mapping\ the \text{ process (t) * No of employees + Developing the robot (t) + Testing the automation (t)) * The rate of internal labor (€/t)} \quad (3)$$

The technical costs depend on the sourcing option of RPA. Anora had their own robot, and they do RPA development in-house. The costs include the robot and orchestrator, virtual machine, and development licenses. The costs can be divided to the automations in production with the formula 1 which was presented in chapter 3.3.2 and below.

$$Costs\ per\ automation = \frac{VM + Developer\ licenses + Robot\ and\ Orchestrator}{Number\ of\ Automations} \quad (1)$$

Robots can perform repetitive tasks faster and more accurately than humans. This enables performing some tasks more often which in turn can result in more accurate and up to date data to be in information systems. Improved data in information systems can lead to less work performed by employees that rely on that data to make decisions, which would mean that automation saves more time than just the replaced human labor.

RPA can also increase employee satisfaction by abolishing the tedious tasks from humans, which in turn can increase employee value by freeing time for tasks that require cognitive capabilities. This increase in satisfaction and the increased free time can be used for performing more tasks or even improving current business.

At best RPA enables innovation for change with solutions that are developed significantly faster than traditional integrations. As robots work with more speed and accuracy there can be business improvements to current businesses or enablement of new business opportunities. This requires that the freed-up time is used efficiently by the employees, and it cannot directly be credited to RPA, but RPA has enabled it.

3. *What is Anora's 2-year roadmap with Robotic Process Automation?*

Anora has already started the implementation process of RPA as ex-Altia chose RPA vendor, done POCs and increased the number of automations in Finland and started the automation implementation in different business units and geographical locations. To continue the RPA implementation, they should increase the number of automations and further expand the geographical scope. The steps for RPA implementation can be seen in Figure 9, where the Anora logo is in the Developing governance step as it is their next step. The already taken implementation measures in ex-Altia are presented in Figure 6.

To ensure smooth scaling of RPA Anora should set up RPA CoE that drives the implementation and builds governance model that is compatible with IT governance of Anora. The CoE should have high level executives, IT team members, and representatives from business. CoE is responsible for carrying out the RPA projects for processes that have been approved for automation and managing the solutions.

Once there is RPA governance in place the next step is to democratize RPA, enable business to drive the implementation. There should be employees that become citizen developers, who will develop automations for their own and their team's tasks. This allows an even greater degree of automation since the processes do not need to be mapped thoroughly before automation. The CoE should still control who develops the automations, support development by offering reusable components and ensure that there will be tolerable risks with automations in production in terms of updating wrong data to information systems.

Utilizing advanced technologies such as ML, OCR and chatbots together with RPA enable more complex processes to be automated. These advanced technologies will cause more complex automations and require additional expertise. These technologies require business case calculations and POCs before implementation and should be considered as add-ons for the RPA platform.

4.2 Discussion and Future Research

This thesis focused on implementing RPA in the case company. It consists of literature review and empirical study of semi-structured interviews for Anora employees and an RPA roadmap that utilized the findings from literature review and the interviews. This thesis started when the RPA implementation was already ongoing, and the case company had already chosen their RPA vendor so selecting the RPA vendor was left outside the scope of this thesis.

The interview results supported the findings of the literature review and gave additional information that was specific for the case company. When the roadmap was developed based on the findings of the literature review and interviews there was no conflicting information. This would suggest that the roadmap for RPA implementation that was produced for Anora could be generalized to other organizations with similar sourcing options for RPA and capabilities for implementation.

The resources required for efficient RPA implementation are presented comprehensively in this thesis. However, there are significant differences between different organizations depending on

the organization size and the RPA sourcing option which affect the required resources that are needed for the implementation. The resources which are presented in the conclusions are applicable to the case company. Future research should focus on the value that RPA provides with different sourcing options.

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APPENDIX

Appendix 1. Interview Questions Business

General information

1. Describe your role and responsibilities in the company?
2. What experience do you have with robotic process automation?
3. What are your expectations for RPA?
4. How much automation potential there is in your tasks?
   - Potential time saved in a week?

Information about the automation

5. Briefly describe the automated process/processes.
6. Was it necessary to make changes to the process before automating it?
   - What changes?
   - How significant the changes were?
7. How much time did you spend on the RPA project?
8. Did the automation help you in your job?
   - How much time did you save now that the task is automated? (In a week)
   - Did you notice any quality improvements?
   - Are you able to perform any other tasks with the time saved?
9. Were there any drawbacks because of the automation?
   - Increase in the number of tasks that need to be performed?
   - Incorrect executions?

Information about the automation process

10. What were the biggest difficulties in the automation process?
11. Were there problems in communication throughout the process?
    - Was the end goal clear in the beginning of the process?
    - Was the end goal reached?

In the future business units could automate their own tasks. There would be training and support available. Teams would also be responsible for automations that are in use for their tasks.

Future citizen developer potential

12. Would you be willing to govern robots that are made to automate tasks in your team?
13. Would you be willing to learn configure RPA robots to automate your tasks?
14. What kind of programming experience do you have?

Appendix 2. Interview Questions Governance

1. Describe your role and responsibilities in the company?
2. What experience do you have with robotic process automation?
3. What are your expectations for RPA?

RPA requires management and governance for the automations. RPA governance is meant to aid the implementation, maintenance, and control of the automations.

4. What kind of governance does RPA need?
5. How does RPA governance fit in with current IT governance models?
6. Are the current resources sufficient to implement RPA at Altia?
7. What kind of minimum testing needs to be done for automated processes before implementing them in the production environment?
    a. For attended automations?
    b. For unattended automations?
8. What must be logged of the robot executions?
    a. For attended automations?
    b. For unattended automations?
9. What risks does RPA utilization present?

Appendix 3. PowerPoint Slides before interviews