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Research and implementation of RPA within an organization

Denis Polkhovskiy

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Author
Denis Polkhovskiy

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The term robotic process automation refers to software that may be efficiently designed to perform fundamental functions across applications, like humans. The software robot can be set up as a workflow with many steps and actions, such as getting forms, sending a receipt message, making sure the documents are complete, filing the form in a folder, and updating a spreadsheet with the name of the form, the date it was filed, etc. The fundamental concept is to identify a simple, repeating activity. Examples include order processing and invoice management. The majority of robotic process automation is currently "rule-based," which excludes AI. However, some existing RPA technologies, such as Power Automate's AI Builder, provide AI as an additional capability.

The main aim of the thesis project is an implementation of RPA within an organization and triggering the use of it for automating other routine tasks. By introducing this practice, we would get several benefits, such as increasing productivity and efficiency and reducing company costs.

Today, besides the challenge of choosing among many available RPA tools on the market, picking the proper initial process for automation is complex. During this research, it was found manual processes at the accounting department that can be automated in a company and implementation of RPA. It was identified potential business processes for automation. Then it was converted to high-level business requirements to detailed development specifications. It was used diagrams for visualizing the process. Test cases were defined for preparing for the final validation after the actual robotic process automation implementation. Then, it was researched current RPA tools on the market and made a comparison of them. Based on the comparison, it was chosen the best which fits a company. Finally, a manual process was selected for the implementation based on previous parts and automated.

In addition, this thesis can serve as a useful guide for acquiring the fundamental knowledge necessary for beginning work with RPA. This work permits a deep dive into RPA, the identification of the optimal manual process, and a comparison of RPA tools.

Keywords
Robotic process automation, Artificial Intelligence, Power Automate Desktop

Contents

Abbreviations

RPA	Robotic process automation
AI	Artificial Intelligence
PAD	Power Automate Desktop

1 Introduction

Innovation is the key to success for businesses seeking to stay one step ahead of their rivals. Accounting and finance are essential for innovation regardless of the type of business.

Unfortunately, legacy operations are impeding the digital transition of basic accounting operations in numerous organizations. Robotic Process Automation can facilitate the technological change of these operations.

Accounting professionals are essential to the expansion of a business, as they provide the appropriate financial data and ideas. They are also responsible for adhering to applicable business regulations. As this strategic direction has expanded, finance and accounting professionals have struggled to complete their job-related responsibilities within the existing operational transactions. Financial experts frequently desire to spend less time on banal accounting tasks and more time on tasks with greater strategic impact.

An ongoing technology megatrend is driving digital transformation initiatives to increase company efficiency, decrease business threats, and increase company transparency. This transformation has introduced numerous complications. This consists of legacy systems, paper-based documents, non - structured files, natural language interactions, and document fragmentation. Organizations must manage these challenges to improve their efficiency in finances and accounting (UiPath 2021).

A typical invoice processing workflow for a human follows several steps. In the first step, the company receives a paper invoice or an invoice by email. Responsible employers should approve these invoices and then submit them to an accounting specialist. An accounting specialist carries this invoice by confirming the approvals. He extracts the key information from the invoice and then enters it into the accounting system. Thought, for big enterprises that receive hundreds of invoices daily. The relevant data may be exported to a spreadsheet and imported into software. When the invoice is added to the accounting software, it can be paid according to the payment terms. These payment runs are conducted manually by accounting professionals by grouping invoices for payment, removing duplicates, and sending money to banks. Prior to robotic process automation, IT systems concentrated on making business processes more efficient and transparent through business process management techniques. They simplified the flow but at a prohibitive cost of development, and even so, it is questionable whether they truly automated the process. It is a point when robotic process automation comes to help (UiPath 2021).

2 Company overview and objectives of the research

This chapter introduces a company for which research is performed. In addition, the research objectives are presented, and the research questions have been formed based on the goals.

2.1 Company overview

The research was done in a company that provides software as a service to insurance companies for managing their business claims, cases, and different processes. Let us call this company “A”. The company is the leading provider of building claims software solutions in the Nordic insurance markets. At the same time, it has a tangible presence in Australian, Austrian, Swiss, and German markets. It provides software solutions for service and maintenance companies to digitally manage a various building, repair, and property maintenance projects. It specializes in both the insurance and construction industries. It supports most of the leading insurance companies in the Nordic markets, the property damage restoration companies that serve them, and other service providers. Company’s solutions increase the transparency, cost efficiency and quality for their customers and are offered on a Software as a Service basis to deliver cost predictability.

2.2 Aims and objectives of the research

This research offers an innovative approach for the working process in company “A”. By introducing this practice, the company would benefit from increased productivity and efficiency and reduce company costs.

The general objective of this study is the implementation of RPA within an organization and triggering its use for automating other routine tasks. It includes several sub-goals. The first aim of this study is to find manual processes at the accounting department, which can be automated in the company and implement RPA. Another objective is to identify potential business processes for automation. Then convert high-level business requirements to detailed development specifications is the next aim. Making diagrams for visualizing the process is another objective. The next step towards the overall goal is the definition of test cases for the final validation after the actual robotic process automation implementation. The next objective includes researching current RPA tools on the market, comparing, and choosing the best that fits the company. Then, the final aim is to choose a manual process for the implementation based on previous succeeded goals and automation of this process.

To sum up, the content of the thesis includes research of processes, selection of one process, research of RPA tools and implementation of one selected process with chosen RPA tool, an overview of consequences after deploying the practice to the working process.

Based on the objectives, the main research question of this study is:
How can RPA be implemented and set as a regular practice within an organization, and how implementation would benefit the company from a business point of view?

The research question can be divided into three sub-questions:

1. What RPA tools are on the market, and which best fits the company?
2. What processes in the company are suitable for automation, and which process to choose as the start of RPA?
3. How would RPA affect the work process after implementation at the company “A”?

3 Research methods

This chapter introduces several research methods in general. The end of the chapter presents how the study would be achieved in practice based on introduced researched approaches.

3.1 Action research

Action research is participatory research in which the aim is to solve together practical problems and achieve change. Shortly this research can be described as “learning by doing”. It aims at improving the situation by actual actions taken by a researcher. The focus is simultaneously on producing researched knowledge and achieving change in practice. A typical target is changing people’s or an organization’s actions. The target may be any phenomenon related to human life or finding solutions to practical problems, such as technical, social, ethical, or professional. In general, the goal of action research is to solve a practical problem in the organization and create new knowledge and understanding about the phenomenon. The action research is problem-based and intensely focused on practice. Typical characteristics of action research are problem-centeredness, active roles of both the subjects and the researcher as actors in the change, and collaboration between the subjects and the researcher (Ojasalo, Moilanen & Ritalahti 2021).

The research proceeds as a circle of planning, observing, and evaluating. In action research, every stage is conducted to each other systematically and critically. The research and development process is cyclical, and it repeats distinct stages. First, the goals are chosen, the development problem is defined, and the objectives of the work are set. After this, literature and other source material are studied to find out if this kind of matter has already been studied. After getting familiar with the subject matter, the development target and goals may be more precise, and the project plan is confirmed. The actual work starts by studying and experimenting with what opportunities there are in practice for proceeding toward the goals. Then the obtained material is analyzed, certain matters are evaluated, goals are modified, schedules are made more precise, experiments are done, they are evaluated. Planning, action, and evaluating the action take turns in the research process (Ojasalo, Moilanen & Ritalahti 2021). These action research stages can be shown as a spiral. Kemmis and McTaggart’s action research spiral is illustrated in the figure 1.

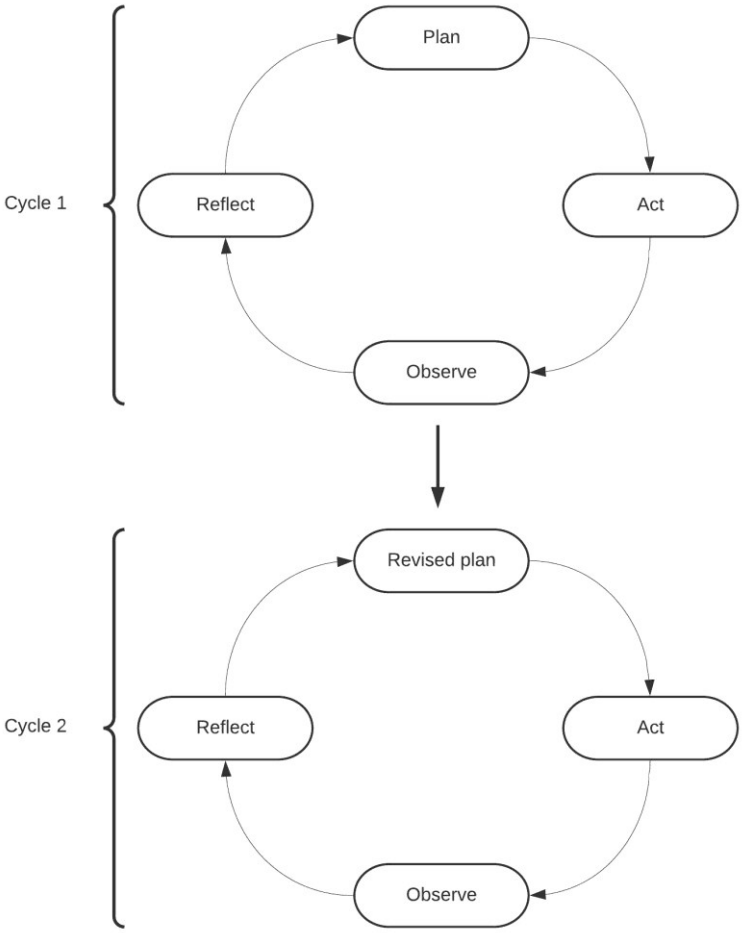


Figure 1. Action research (Ojasalo, Moilanen & Ritalahti 2021)

The action research participants are at every stage responsible for their actions to the other members of the group and, of course, to themselves. The developer's role in action research is different from the other approaches because, in action research, the developer is always an active member of the group. In addition, it must be remembered that the participants are equal regardless of what their position is in the organization. Action research can take much time as the question is always about making a real change (Ojasalo, Moilanen, & Ritalahti 2021).

3.2 Case study

A case study is an in-depth analysis of a specific situation. The case can be the whole company, its department, staff, product, customer group, system, or for example, a process. The case study is characterized by striving for producing in-depth and detailed knowledge about the studied case. The case study makes it possible to give space for understanding the diversity of the phenomenon without trying to simplify it too much. It is more important to learn much about a restricted target than little about a broad group in

the case study. The question is not about how general something is but how something is possible or how something occurs (Ojasalo, Moilanen & Ritalahti 2021).

There are only a few research targets in case studies, often only one. The case can be an individual, group of people, organization, event, operation, process, or geographic area. The most essential is that the target is understood as a specific entity, a case.

The starting point in a case study is usually the case to be analyzed or studied. It is often necessary to get familiar with the subject matter before knowing what can be asked about it and the actual development task. After that, it is possible to start asking more precise questions, which help search for necessary background information. Then, it goes the development of suggestions or models. The figure 2 illustrates the standard case study process.

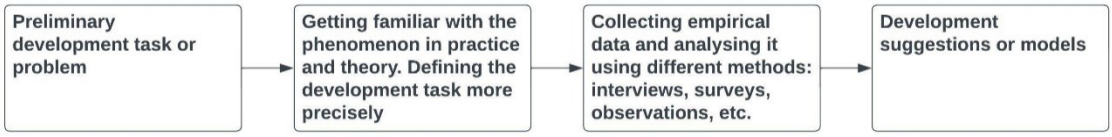


Figure 2. Typical case study process

3.3 Constructive research

Constructive research is an approach where the focus is on real-life problem solving and innovations. In constructive research, the goal is to solve a problem in practice by creating new construction, i.e., a concrete output, for example, a product, information system, guidebook or handbook, model, method, or plan. The constructive research methodology is characterized by the close integration of theoretical and practical aspects. Trying to implement the developed solution and analyzing its functionality and utility are crucial components of constructive research. (Ojasalo, Moilanen & Ritalahti 2021).

As in all other research approaches, it is recommendable that a project based on constructive research follows a standardized process. The typical process of "scientific" constructive research starts with identifying primary aims and continues with a look into literature and other project-related material to be able to define the scope further. The next step is to summarize the theoretical framework and make plans for data collection based on that. Data are collected in separate phases and with different methods to get as many insights as possible before the final product or service is offered to customers. During the final phases, the report is written, and the results are disseminated both internally in the organization and externally to customers and other stakeholders. The fact that the

prepared construct should be commenced and taken into use is left out from the figure since it is up to the commissioner to order the project what will happen when the research process is finished (Ojasalo, Moilanen & Ritalahti 2021). The figure 3 represents a summary of the typical constructive research process.

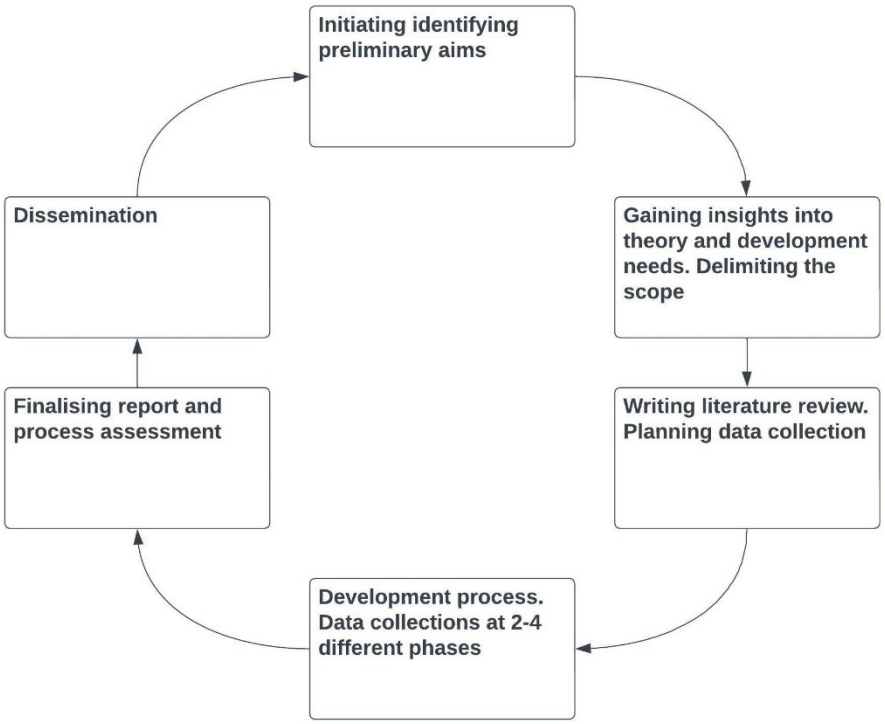


Figure 3. Constructive research process

3.4 Interviews as a data collection strategy

Interviews are among the most common data collection techniques used in research and development. The purpose of interviews can be, for example, to clarify matters or gain a deeper understanding (Ojasalo, Moilanen & Ritalahti 2021).

There are different interview methods. Choosing an interview for the data collection method requires reflection on what kind of interview is planned, which is affected by what information is needed to support development work (Ojasalo, Moilanen & Ritalahti 2021).

Structured questionnaire interview is often considered a category of their own and the other types a different category. In a structured interview, the questions have been formulated, and they are presented in the order decided before. Only the content of the answers is left open (Ojasalo, Moilanen & Ritalahti 2021).

In a semi-structured interview, the questions are formulated beforehand, but the interviewer can change their order during the interview. If some new questions occur to

the interviewer during the interview, they can be asked (Ojasalo, Moilanen & Ritalahti 2021).

In an open-ended interview, the interviewer and the interviewee discuss the theme or problem agreed on. The discussion is open, and both parties participate actively and equally. The discussion can also be informal (Ojasalo, Moilanen & Ritalahti 2021).

In an in-depth interview, the interviewer and the interviewee have a confidential discussion on the topic of interest. The interviewee is encouraged to tell his thoughts about the topic as openly as possible. The main thing is to achieve the goals aimed at. New and even important themes often come up during the interview (Ojasalo, Moilanen & Ritalahti 2021).

In focus group interviews, the interviewer gets the views of several participants when in-depth individual responses are not required. Such an interview can give the interviewer an indication of whether there are shared views or varying opinions in a group. It can be that the interviewer indicates whether there are shared views or varying opinions in a group.

Usually, interviews should be recorded as it liberates the interview from observing the interviewee. After the interviews as the data are usually transcribed. When the interviews are transcribed, whether the text should be written in literary or spoken language must be decided. The decision depends on how the data is utilized, especially in the analysis and reporting stages. Many interviews include both structured and open-ended questions, in which both quantitative and qualitative methods are used to process the data (Ojasalo, Moilanen & Ritalahti 2021).

An analysis is started by reading the transcribed or otherwise processed data material several times. After that, it is classified as striving to find connections to the theory applied. Then the developer reverts to the whole interview, interpretation, and linking the phenomenon to the applied theories or outlining the theory again (Ojasalo, Moilanen & Ritalahti 2021).

The saturation point occurs when the researcher no longer receives or sees added information when new interviews no longer give essential information (Ojasalo, Moilanen & Ritalahti 2021).

It is recommended that the interview material should be analyzed as soon as possible after the interviews when the information is still fresh, and the interviewer can remember it well (Ojasalo, Moilanen & Ritalahti 2021).

3.5 Collaborative data collection strategies

There are numerous collaborative data collection strategies. Typically, several people create together new viewpoints by applying creative methods. The purpose is to generate as many ideas as possible and record them. All ideas are not good, but there are usually more clever ideas in a vast group than in smaller groups (Ojasalo, Moilanen & Ritalahti 2021).

Brainstorming is one of the standard creative problem-solving methods in which ideas are generated in groups. A group of 6-12 persons led by the facilitator aims at ideating original approaches or solutions to a problem. Osborn's book Applied Imagination fueled the spread of group brainstorming as a tool for increasing creativity in organizations (Osborn 1953). The traditional procedure consists of rules that encourage high productivity (Osborn 1953). These rules express all ideas that come to mind, the wilder, the better and quantity is wanted, so the better. Criticism is ruled out and improve and combine ideas already presented (Sutton 1996).

The 8x8 method is a method that resembles the mind map but is a more disciplined ideation method. The problem is written down on an A4 paper, after which eight papers are placed around this, and a viewpoint is written on each of these. The resulting eight viewpoints become new starting points from which eight ideas are generated (Ojasalo, Moilanen & Ritalahti 2021).

The six thinking hats method is a mixture of ideating and analyzing. The main idea is to examine the problem from different perspectives and inspire the participants to change their perspectives. The primary limitation of idea is that it defends the ego, which is accountable for the majority of practical thinking errors (De Bono 2017). The hats allow us to consider and talk about things we really cannot normally consider or express without endangering our egos (De Bono 2017). Hats describe different viewpoints in distinct colors, which the individual members of the group or the whole group can vary. The whole group can take turns in adopting different perspectives to the problem, or the whole group may take turns in wearing a hat in a similar color (Ojasalo, Moilanen & Ritalahti 2021).

Main focuses of hats by color:

- White is neutrality and objective facts.
- Red is emotions, hunches, and intuition.
- Black is critical and cautious.
- Yellow is optimism.
- Green is creativity.

- Blue is control.

The basic idea of remote thinking models is selecting some remote thinking model that is then applied to the problem in a ”crazy meaningful” way. The first step is to develop a list of the characteristics of this thinking model. For example, if the purpose is to design a new school rucksack, the remote thinking model can be a comb. Characteristics of a comb are, for example, teeth, plastic, small size, lightweight, hardness, and glossiness. Each characteristic is examined, and based on that, a suggestion is made for a new rucksack. For example, the teeth of a comb can generate the idea of a” toothy” rucksack, which may generate the idea that the rucksack has plenty of pockets. When all the characteristics have been examined, there are numerous suggestions for a new rucksack. The final rucksack is most likely to combine several new characteristics. A remote thinking model can be selected from everyday life (Ojasalo, Moilanen & Ritalahti 2021).

The Osborn checklist includes questions that help in generating innovative ideas concerning, for example, an existing product or service. It may make it possible to develop a new product or service. It helps to get rid of the familiar thinking routes. The goal is to generate as many new alternatives as possible when the problem and the question are reflected on. The purpose is not to answer the questions but to open new perspectives for thinking (Ojasalo, Moilanen & Ritalahti 2021).

Bodystorming is a generic name for many kinds of methods. The connecting factor is the use of physical activity when the purpose is to understand the users and the context, which is the development target (Ojasalo, Moilanen & Ritalahti 2021).

Central characteristics of bodystorming:

- Based on ideas, physical prototypes are made immediately, and testing starts in the field.
- The user environment is created in the place of idea-generating, for example by using maps and staging and acting different events and situations in which the ideated products are used.
- Based on information collected in user research, users are described as typical user characters whose roles designer group members take in different situations. It is assumed that the actor can act in the same way as a real user also in situations in which observations have not been made, i.e., to use the ideated equipment or service in the same way as the user.

In using excursion techniques, the focus is on getting distance from stagnant idea generation. These techniques include, for example, association games, role play, drawing, and serial stories. Heuristic idea generation techniques are often called heuristics. It is

used to systematically generate and evaluate ideas generated for solving problems or creating development alternatives in different situations (Ojasalo, Moilanen & Ritalahti 2021).

Wish lists suit well for developing products and services as they enable the company to clarify customers' expectations and needs. It is not often easy for customers to talk about their expectations if they are unaware of them. Customers can more easily tell what they do not get than describe what they would like to have or need in certain situations. The purpose of the wish list is to find out what customers would like to have if they did not have any restrictions. It draws attention only to real or imagined benefits. When this technique is used in group discussions, all comments and ideas are written down on the board, and no one can criticize them (Ojasalo, Moilanen & Ritalahti 2021).

Crowdsourcing describes a dispersed problem-solving and production model in which the commissioner utilizes the community's competence for a specific limited task. Crowdsourcing refers to a practice in which the company or organization outsources some activities that their staff had earlier performed (Howe 2006). Activities can be outsourced to an undefined network of people in the form of a free invitation. This can mean measures taken by individuals, pairs, groups, or crowds. The critical characteristics of crowdsourcing are open invitations and an extensive network of participants (Ojasalo, Moilanen & Ritalahti 2021).

3.6 Decisions based on surveyed research methods

The best research approach for this idea is constructive research because we focus on real-life problem solving and bringing innovations. As a starting point, research can be split into two problems, and for both problems, we would use constructive research techniques.

The first problem is which RPA tool should be selected. The selection would be crucial for the company and future RPA maintainers and developers because the proper tool selection is a foundation of future successful practice. The research on this problem should be done thoroughly. For solving the problem, data about tools will be collected from various sources to get as many insights as possible before making any decisions. After it, the retrieved data would be analyzed using a decision matrix with criteria for showing relation and comparison for analyzed tools.

The next goal is to solve the problem of manual processes by creating concrete output. In this case, it is a process definition document (guidebook or plan for implementation). Before collecting the data, we should first identify the problem. In this topic idea, the

problem is manual processes. Based on it, we should focus on data collection processes. Based on the covered information in this chapter, the best one to choose or first to be used interview. Since the company is small and by defining the right group of people to interview, we can choose several interview methods or use a mixed interviewing strategy to gain the best output. First, the process can start with semi-structured interviews. I cannot entirely agree that interviewees should know questions beforehand, but, in this case, it would be good to let people think before since results are made based on well-thought answers. Then perform analyses of interviews. After the first loop of the interview process, we can perform open-ended interviews to discuss thoughts or ideas that emerged from the first round and then move to the next step. Finally, in the last round, we can have a focus group interview with a group of people to discuss the results of previous steps and indicate if views for results are the same or vary. Otherwise, this step can use a collaborative data collection strategy known as brainstorming with this group of people, and I can be a facilitator of this session. After analyzing the previous step, saturation point can be achieved where new interviews or data would not give new essential information.

The research would be started with a broad scope, but by answering research questions and progressing, it would be narrowed to one manual process and one RPA software to implement the practice.

4 Robotic process automation

This chapter discusses the central concept of the research "RPA" in detail. It includes an RPA overview, general drivers, and blockers. Also, we would go through the maturity and adoption level of RPA and see its opportunities and challenges.

4.1 Overview

The Institute for Robotic Process Automation provides the following definition of RPA. It defines *robotic process automation* as the application of technology that enables employees to configure computer software or a 'robot' to capture and analyses current software systems for executing a transaction, managing data, initiating responses, and interfacing with digital software (UiPath 2021).

Previously when people mentioned automation, it was mostly referred to as hard-coded automation workflows or Application Programming Interfaces calls into software programs. In comparison with that, RPA imitates a human's steps on top of existing tools. RPA acts similarly to an individual who reads and assesses information from a document and transfers it to multiple software systems on their desktop. RPA is a computer-coded application that can substitute people conducting monotonous rules-based activities, and it has macros that span both functions and applications (Deloitte 2019).

RPA can do following actions (Deloitte 2019):

- Accessing email and attached files.
- Logging into web/enterprise applications.
- Moving files and directories.
- Copying and pasting.
- Form fillings.
- Ability to read and write to databases.
- Extraction of data from the web.
- Integration with system API.
- Making calculations.
- Data extraction from documents.
- Gathering social media data.
- Following ‘if/then’ decisions/rules.

Robots are able to easily transmit data across tools, emulating operations such as clicking, typing, and navigating between windows. In addition, these robots may use

native and Artificial Intelligence and Machine Learning extensions to enhance overall performance and learn from past experiences.

With RPA, accounting specialists can automate multiple processes they were earlier unable to. In order to select the appropriate operations for automation, they should have some of the following characteristics (UiPath 2021):

- The processes and their underlying applications must be stable
- Rule-based process
- Low exception rate (low variation between processes)
- Highly repetitive, manual, and high-volume operation
- The inputs should be electronic or machine-readable

The future role of managers in accounting departments will shift from controlling people to generating higher-value tasks, including exceptions and judgments involving human expertise, from their personnel. The orchestration engine simultaneously monitors operational performance. Finance and accounting professionals will shift away from data collection, data entry, and bookkeeping in favor of advising positions, where their judgement and consulting abilities will enable them to become company partners (UiPath 2021).

Automating simple processes such as invoice data entry and cash applications is an excellent starting point for a business with RPA (UiPath 2021). Before embarking on the RPA journey, these activities are ideal for conducting proof-of-concept research.

The most profitable way for automating general accounting processes is to take a more agile and iterative approach for effective automation of the process (UiPath 2021). RPA, AI, machine learning, and other advanced cognitive technologies are complementary. Although RPA alone can perform rule-based, repetitive tasks, incorporating AI, ML, and cognitive technologies into RPA can improve the process. Cognitive and machine learning technologies can perform many different actions. It can include obtaining payment information from invoice photos, extracting data from emails, documents, and bank transaction messages, and so on. In these situations, RPA is utilized to manage open receivables using accounting system data, get bank statements and input them into the accounting system, and automate matching payments to open invoices and closing them.

Using native features, numerous current ERP systems, such as SAP and Oracle, have significantly automated cash-process handling. They have achieved a level of automation up to 50 per cent. There are still many exceptions or fallouts that require

human effort. With the help of RPA combined with AI and ML percentage of ERP automation can be increased up to 90 percent (UiPath 2021).

RPA is a disruptive technology that can considerably change how existing industries function. It replaces the well-established finance and accounting practices because it has significant advantages over the old way. As the RPA continues to evolve, we can be sure that it will play a significant role in disrupting many widely accepted processes as standards today. However, the reality is that the potential for automation extends far beyond industrial application.

4.2 General drivers

The RPA installations that enhanced the sharp rise of software robots in recent years have produced a wide range of advantages. According to the "Robotic Process Automation Implementation Drivers" article (Kedziora, Leivonen, Piotrowicz & Öörni 2021), the investment return varies from 30 to 200 per cent in the initial year. As a result of the personnel having more significant opportunity to concentrate on the client relationship, thus customer service is getting better. In addition, staff can profit from decreased duties, enhancing the value of company interactions with clients. Businesses can measure the success of the implementation of RPA in terms of newly released hours for distributing for other tasks. It gives employees relief from monotonous activities. They can now focus on value-added duties, forcing the organization to plan sophisticated HR policies to retrain workers and use their free time for self-improvement. The benefits of RPA fall into four major categories: cost reduction, improved productivity, customer service enhancement, and employee engagement.

RPA can play a critical role in changing operations for accountants and finance professionals. Previously, companies outsourced numerous transaction-heavy accounting tasks to locations with cheaper labor. RPA aligns the benefits of using less paid labor markets from traditional outsourcing or offshoring key business processes with using resources on a place. It increases productivity and effectiveness without raising risks or negatively impacting client service (UiPath 2021).

RPA can supplement and increase employees' work capabilities. It lets people accomplish more with fewer resources in less time. The robots used in RPA are considerably cost-effective at handling large repetitive tasks. They can operate all the time without any exhaustion (UiPath 2021). Even though there are initial practice establishment expenses and ongoing maintenance expenses, the return on investment with RPA is much higher.

Nonetheless, investment return may not be the only driving factor for many accounting departments. Additionally, RPA offers enhanced risk management and compliance, greater precision, reduced cycle times, and increased throughput. It is crucial for end-of-month reporting and accounts receivable, reducing the average time it takes for a business to receive money for sale. Robots release costly to finance and administrative resources to focus on higher-value tasks and outputs, enhancing employee satisfaction, profitability, and consumer experience (UiPath 2021).

4.3 General blockers

The article by Kedziora and others (2021) shows five categories related to risks in RPA implementation. These categories are executive, technical, change management, operational, and functional risks.

Numerous business exceptions may be triggered by the robot's speed and the lousy quality of input information. The methods through which robots perceive GUI components are already strong. Particularly when engaging with the virtualized environment, they are insensitive to system difficulties and changes. Robots lack human rational thinking, and their outcomes are predetermined. Any input or process logic defects will result in the bot repeating mistakes until someone corrects them. Another factor limiting the adaptation of RPA is unstructured data. RPA requires structured data, but in many companies, documents are primarily unstructured, even though some tools can help structure the data before the start of the use of RPA (Kedziora et al. 2021).

In some cases, handwritten documents can be a common blocker in the adaption of RPA since it can be a big challenge when there are many of them. RPA should have proper recognition functionality for managing such documents (Pritzker 2020).

One of the crucial blockers is variation. In case if RPA can manage ninety percent of transactions in ten steps, but ten percent of this process requires an extra two steps for completion after step three, then automation should have an exception rule for managing these steps. Exception handling needs to be added into the workflow to address the variation in this scenario. Even though these operations may also be automated, integrating workflows into the robotic process can be time-consuming; therefore, the firm must determine if investing the additional time is worthwhile (UiPath 2021). It is a point where the role of humans in the RPA process is fundamental. In such digital transformation, accounting professionals become experts in exception handlers, whereas robots handle repetitive and routine tasks. Humans will be required to execute complicated, judgment-based tasks that RPA cannot perform (UiPath 2021).

4.4 Maturity and adoption level

Based on the article “The Five Dimensions of Digital Technology Assessment with the Focus on Robotic Process Automation (RPA)” (Harmoko 2021), the RPA evolution can be split into three phases.

In the early phase of RPA (RPA 1.0), The Assisted Robot automates various jobs or processes on a personal workstation to reduce manual handling time and costs and improve precision. Unfortunately, the assisted RPA still involves human assistance during actual RPA process execution.

Robots are installed on multiple desktops in the second phase of RPA (RPA 2.0). Robots run with less human intervention and autonomously connect into a designated system, initiate an activity, monitor its status, and finish it. These operations are managed on the interface, which features many panels for assigning jobs, modifying destinations and queues, and responding to robot output.

Cognitive RPA is the final stage (RPA 3.0). Innovative end-to-end processes utilize machine learning, pattern recognition, computer vision, and processing of natural language to manage lengthy and complex operations.

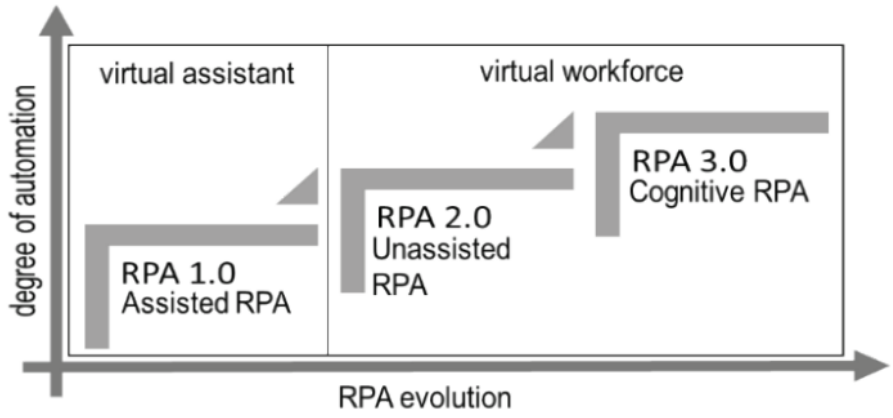


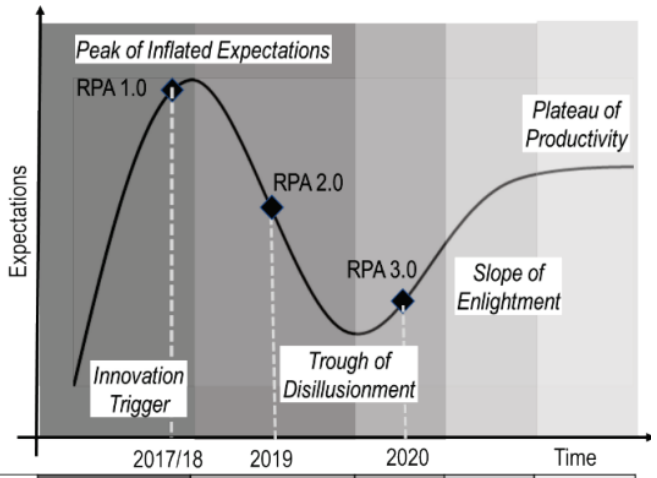
Figure 4. RPA evolution (Harmoko 2021)

Gartner Hype Cycle is a concise summary of the novel technology, innovation's market expectation and perceived value. Gartner Incorporation introduced this overview in 1995. Every year this overview is updated development technology and changing market expectations. Around ninety Gartner hype cycles describe various technologies, such as AI, digital marketing, advertising, et cetera.

In Figure 5, it can be seen a modification of the Gartner Hype Cycle with five distinct zones ranging from one to five. The color is determined by the duration of the entry period

and the likelihood of failure. The deeper the color, the lengthier the entry time and the greater the danger associated with the examined technology. At the beginning of the cycle, industry reactions to recent technologies ranged from mild interest to euphoria. An increasing market percentage usually observes euphoria. It occurred when RPA was introduced in the market until 2018. RPA expanded then, and its location was in the "Peak of Exaggerated Expectations." People view RPA as a solution for workplace automation that provides total flexibility and is user-friendly. Nevertheless, this is incorrect, and the public was dissatisfied since RPA is not entirely automated. In addition, it cannot recognize actual papers, including hard copies and handwriting. This disillusion has ushered in 2019's "Trough of Disillusionment." Gartner predicted that RPA would ascend the "Slope of Enlightenment" by 2020 because of the great hopes for cognitive RPA. RPA's cognitive capabilities include artificial intelligence, machine learning, and natural language processing, enabling it to analyze paper files and make effective activities.

It is anticipated that cognitive capabilities can elevate RPA to the "Productivity Plateau." UiPath and Automation Anywhere have implemented the cognitive RPA. AI Fabric, an UiPath AI capability, trains a robot to comprehend and read many types of physical papers in various languages. It enables bots to communicate with screens and engage in conversations with humans. Additionally, the robot is trained to improve organizational performance by utilizing process mining and task mining functionalities. UiPath and Automation Anywhere prepare RPA for a completely automated end-to-end process with AI capability.



Area	1	2	3	4	5
Introduction time	very long	long	middle	short	short
Risk to fail	very high	high	high	middle	small

Figure 5. The RPA Position in Gartner Hype Cycle (Harmoko 2021)

Based on Harmoko (2021), the best time for implementing RPA is when technology is in the "Climbing the Slope" phase. It is a prudent alternative strongly advisable due to the reduced danger and quicker entry period. If a firm has essential skills and a substantial office automation burden, such as an online shop, bank, or insurance company, implementing RPA as early as feasible or while the innovation is in its infancy will boost its market position. However, it is extremely dangerous and time-consuming.

Nowadays, the RPA is now at the "Climbing the Slope" phase. Nevertheless, AI skills in RPA still need to be improved for reaching the "Slope of Enlightenment" and "Plateau of Productivity" phases in the Gartner Hype Cycle.

The automation era is here, and RPA can help companies succeed and thrive in this time of technological innovation and disruption. As shown in this chapter, the adaptation and maturity of RPA are good enough to consider implementing the technology. The shown interest in RPA has revealed the tendency to grow significantly worldwide, and the community of users has grown. Based on the Gartner hype cycle, we can see that the chasm was crossed over, and now is the ideal time for all businesses to examine RPA as a company task automation strategy.

4.5 Opportunities and challenges

Robotic process automation is frequently viewed as a panacea for enhancing business efficiency and lowering expenses. In this section, let us examine the advantages and disadvantages of RPA.

4.5.1 Opportunities and benefits

In most cases, many companies' accounting and finance departments are usually among the first to realize the benefits of automation in their regular operations as can be seen on figure 6 (Deloitte, Financial reporting RPA risks and controls 2021). Furthermore, since automation eventually affects the entire company, automation of accounting and finance operations may yield much more extensive economic outcomes (ElectroNeek 2021).

Consequently, RPA might be advantageous for accountants and financial specialists who oversee activities with a high degree of responsibility and precision. Any of their faults might result in costly issues for the business.

According to a study by Gartner (2019), a human prone error in the finance process in an annual average of 25,000 hours of unnecessary rework at the expense of $878,000. RPA

can manage irregularities in employee effectiveness, establishing a structure that elevates specialists to more crucial roles and improves corporate outcomes.

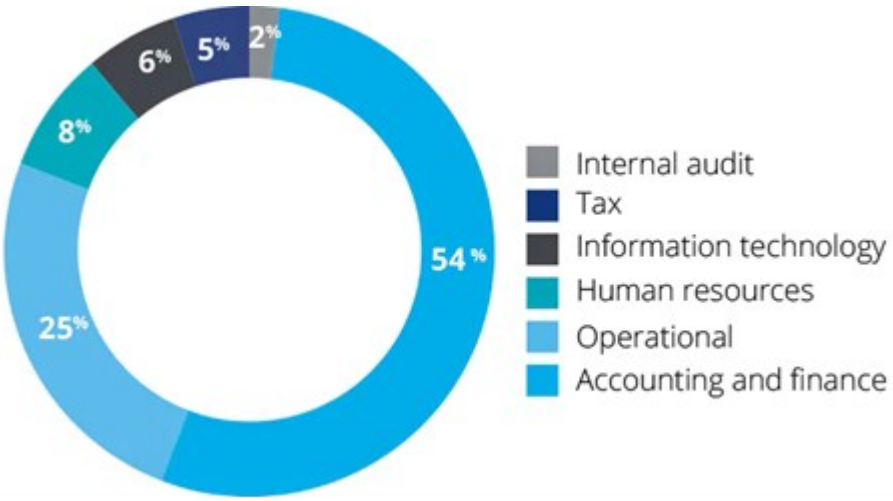


Figure 6. Types of RPA deployment

According to Ernst & Young (2021), the tremendous potential application of RPA is for the following fields:

- Bank reconciliation process.
- Sales ordering and invoicing.
- Fixed asset management.
- Financial and external reporting.
- Inventory management.
- Receivables management.
- Payables management.
- Financial statement closing.
- Tax planning and accounting.

The most satisfying aspect of robotic process automation is the quick investment return that occurs once RPA is deployed. Robots do not physically integrate into a company's information structure, which is considered low-hanging fruit due to its comparatively simple implementation (ElectroNeek 2021).

Consider the three most prevalent RPA application cases in finance and accounting: accounts receivable, payroll, and financial reporting.

Accounts receivable is an ideal starting point for automating financial processes. Accounts receivable uses fewer external data in comparison with accounts payable. Days sales outstanding is the significant RPA parameter that may be used here (ElectroNeek 2021).

It relies significantly on both the payer and the receiver's human factors. If an accountant forgets to deliver an invoice, the result is more than a monetary shortfall. If it occurs frequently, it threatens the order-to-cash process and impacts stability. When RPA is implemented, robots will function like a virtual team. They allow rapid resolving of email bills. It also goes a consistent cash flow without deficiencies by automating this task. Besides reducing cash gaps, RPA can assist input information. Also, it helps accountants to have less juggling in multiple information systems.

Moreover, the following lists illustrate accounts receivable jobs and procedures that can be automated intelligently (ElectroNeek 2021):

- Customer data setup and management.
- Extracting customer information from various sources.
- Sales quotation and entry generation.
- Invoice generation and distribution.
- Cash application.
- Customer credit monitoring.
- Dispute resolution.
- Follow-ups, reminders, and dunning.
- Credit risk management.
- Chargeback.

In payroll use cases, bots assist in reducing payment delays and mistakes by completing information input, timesheet checking, and reducing computations.

RPA can assist in several situations involving payroll processing:

- Employee data extraction.
- Data verification across information systems (sick days, business trips, timesheets).
- Generating and approving timesheets.

A secure method to observe financial performance is following profit and loss daily. Nevertheless, manually editing profit and loss statement reports is tiresome and takes a lengthy process. Such tasks can be managed by RPA, which can also generate flawless reports in real-time. The automation makes business processes transparent and guarantees financial forecasting exactness.

There are several reporting processes where RPA can be helpful to be applied (ElectroNeek 2021):

- Trial balance and balance sheets.
- Income statements.

- Profit and loss.
- Variance analysis.
- Financial close processes.
- Regulatory or management reports.

4.5.2 Challenges and risks

As shown in a previous chapter, RPA offers many benefits to a business. Everything has two aspects, and RPA has its problems and threats. Typically, RPA is a quick solution. It can offer instantaneous usefulness but demands complicated omnichannel platforms and frequent workflow assessment and optimization eventually.

Few RPA technologies presently on the market provide modest features of machine learning. There is still a long way to go until automation is really intelligent. With AI and ML incorporated into RPA systems, the capability for automation will grow tremendously. Unfortunately, we have not yet arrived there.

The next challenge is ownership. It means that the owner of the RPA process should be defined. Unknowing RPA roles and responsibilities in an automated environment can create disconnected dots. It causes a lack of ownership and responsibility among different teams.

Selecting wrong use cases for automation is a typical mistake that challenges RPA implementation and reduces ROI. It is essential to make a case for a proof of concept before going forward with automation. The most appropriate processes should always be selected to begin a successful automation journey. Not all processes are suitable for automation. Based on standardized and predictive rules, processes should be identified with clear processing instructions. Processes that demand a high grade of manual input, structured and repetitive input, involve more human mistakes. These processes are always good to be started for automation.

Lack of skilled resources can be the next challenge. With the growing popularity of RPA, the need for skilled labor has been increased. RPA implementation can be blocked if a team lacks skilled resources.

Another challenge is automating processes end to end. Sometimes RPA cannot wholly automate some processes, and it requires the use of machine learning algorithms, which can add extra costs to the company and the project. The best way to manage it is to use the divide and conquer technique. Such scene action should be split into simpler parts

and then automated. Another thing to consider is that the extra costs involved in delivering end-to-end automation raise cost-efficiency questions.

Lack of support from businesses is another risk. Most RPA implementations fail because of a shortage of required support from the businesses, like workflow diagrams or other "if" scenarios or how the bot should process different business rules for different data types. Businesses should provide a comprehensive list of technical exceptions that the operations team may encounter during manual processing (CiGen, 2021).

The next challenge is cultural change. RPA implementation needs a cultural and mindset change starting from the senior leadership. Employees' resistance should be managed because it is the main reason for the lack of willingness to accept RPA. Misunderstood information about RPA can often create suspicion among people about losing their jobs. Before starting the automation project, a company should educate employees about what software robots can and cannot do. It should be clarified that the bots are to be seen as helping, not replacing their current work roles. Also, a company should train employees regularly since the automation era will require them to develop new skills.

Unfollowing RPA best practices can create other risks. If the team does not follow best practices in RPA implementation, it can result in more invested time debugging the code and challenging possible reuse of the workflow in the future for teams.

The next challenge is unclear expectations. They always should be reasonable and not be over-enthusiastic. When a goal is not clear, the team, management, and other stakeholders involved in the RPA implementation would not be able to measure the success of the technology, and unclear can frustrate its progress. A practical method is, to begin with, a clear ranking of business goals and then finding out how RPA can help achieve them.

Technical ambiguity makes another risk. In some cases, RPA deployment does not bring expected results because of ambiguity among the technical team. The deployment of automation can fail when technical questions are not clarified about operating requirements during the implementation.

Another big challenge is a lack of infrastructure. Satisfactory results cannot be achieved without proper infrastructure and investments in RPA.

5 RPA tools

There are many tools available in the market to implement RPA. Understanding the essential functionalities of an RPA tool is vital to choose a suitable tool for the company.

Core functionalities of RPA tools include:

- Gather inputs from other systems and decide their course of action.
- Program other bots or software robots through an interface.
- Interact with other systems via API integrations and screen scraping.

It is crucial to select the most suitable tool for business. Before selecting, we should define our requirements. We can highlight several criteria that seem most valuable for us at that moment.

Technical features are one of the most important aspects to consider when selecting an RPA tool. The tool must be platform-independent and should support any type of application. It should have characteristics like as screen scraping, scalability, and cognitive capacities. We should check a tool's security features because the software robots manage confidential data. The extent of security should be ensured before choosing an RPA tool because essential security measures are always necessary to avoid the misuse of confidential data or privacy issues.

Before selecting any RPA technology, the total cost of ownership is an additional vital factor to consider. It relies on elements such as license fees, implementation costs, and maintenance expenses, among others. It should be ensured that the chosen tool meets the dedicated budget for the deployment of this practice. In our case, we decided to start small and then expand to a larger scale when necessary. It would be easier to realize and filter what tools functionality is needed for the company's business process when working with the technology. By doing small steps, the company can also minimize expenses on unnecessary RPA tools and help to invest effectively.

Ease of use is the cornerstone for automation. The chosen tool should be user-friendly and versatile enough to support fundamental automation procedures. Whichever tool we choose, we must consider that it does not need much training and is entirely user-friendly. RPA tools are created to simplify complex operations and automate them to decrease human mistakes. It should be mirrored in the design of its interface. RPA tools should be comfortable for all employees, regardless of how comfortable they are with programming techniques since it will lead to higher levels of adoption. A complex user interface will slow down implementations and cause novel issues. Good indicators of ease of use are

characteristics like image recognition and drag and drop functionality. Hence, the more accessible the tool to use, the faster the benefit to the company.

Exception handling is the following criteria to consider. The preferred RPA tool must include a thoughtful procedure for addressing exceptions. Automated error detection should be more efficient than manual error detection. When errors require human attention, they should be redirected towards experts. Nevertheless, if those errors can be managed automatically and there is no need for human experts, it will increase the speed of all operations.

RPA tools providers should offer strong vendor support to their clients and preferably have extensive experience. It is always good to choose dependable providers with a good support system. They should have automation experts and offer specialist advice to ensure the business does the best with the tool. It is easy to resolve any issues arising during the implementation and maintenance phases with such support. Extensive support helps make smoother deployments, increasing technological innovations, training, certifications, and more.

Reliability is an essential factor while considering an RPA tool. A product with a notable history on the market and a solid reputation would be a more dependable option than one recently launched. Communities associated with this technology are another vital aspect. When a community has a large number of developers and users, this may signal an abundance of knowledge and answers to issues, and it would be easy to discover solutions to problems without paying for substantial vendor assistance.

Longevity is an aspect that affects the tool's future, while reliability shifts attention to the past and present. Since the user community is growing faster for free solutions, tools with open-source code have a longer lifespan.

At the end of the chapter, after making an overview of the most popular tools, we will weigh our defined criteria against their characteristics before selecting the RPA tool.

5.1 Selected tools

By that moment, we have explored multiple internet resources. Most influencing on selection was two sources. The first one was PeerSpot, and we went through the Robotic Process Automation section there (PeerSpot 2022b). This platform allows real users to share their experiences using tools and technologies. The second influencer was a report by Gartner, which is called "Magic Quadrant for Robotic Process Automation" (Gartner 2021), visual representation of it can be seen in figure 7.

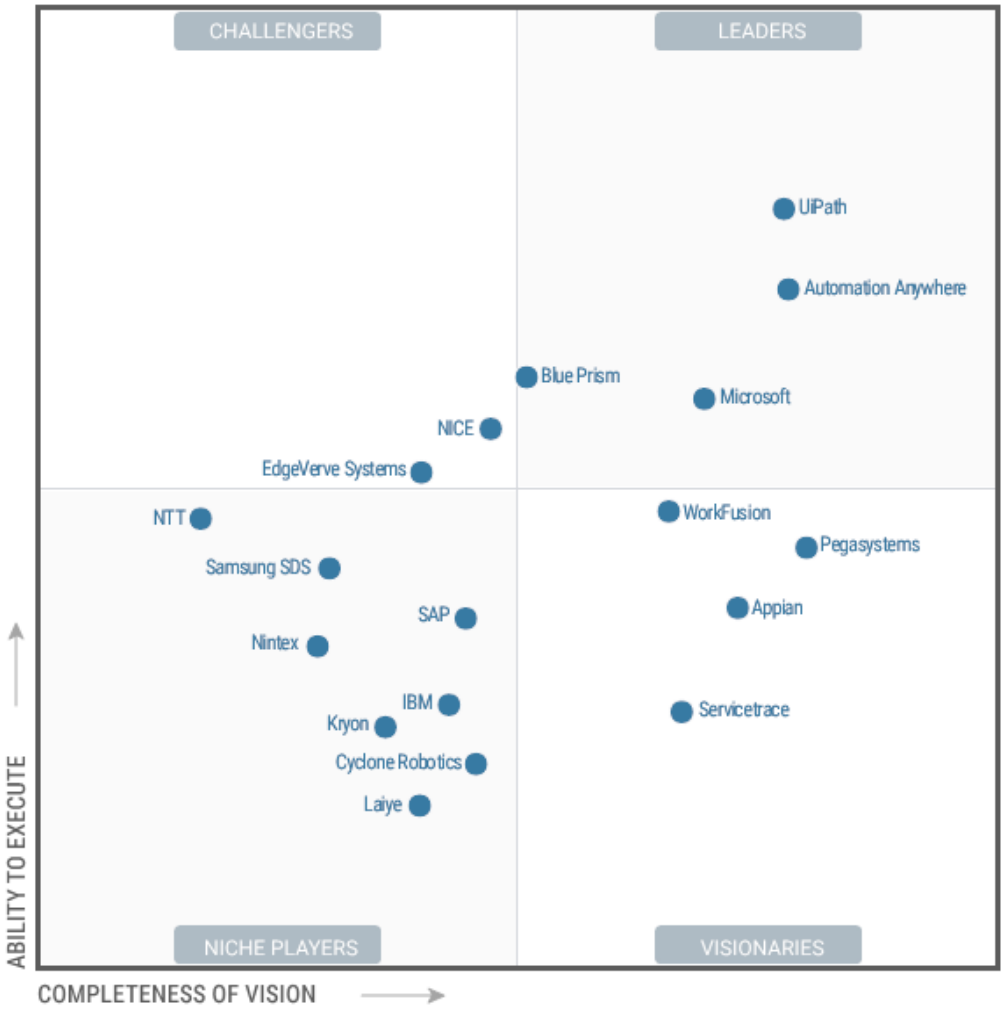


Figure 7. Magic Quadrant for Robotic Process Automation (Gartner 2021)

In light of this, we have chosen the four most prevalent, popular, and promising technologies available today.

5.2 UiPath

UiPath is a well-known RPA technology that allows users to automate manual, tedious, and varied business processes. This open-source platform is generally used for automating processes in PDF, online, Citrix, and Windows software applications (PeerSpot 2022f). The UiPath has a huge community consisting of more than one million users (Gartner 2021).

UiPath possesses several unique characteristics, including a comprehensive library of activities, an automation center, process and task mining, and task recording. In addition, it has server-side events to initiate automated procedures, database interaction, scraping, PDF functionality, streamlined authentication, and marketplace templates (Gartner 2021).

Users may automate processes without previous programming experience. Trained AI robots boost efficiency and productivity and improve overall customer happiness. With UiPath Marketplace's drag-and-drop AI functionality and ready-to-use patterns, users can automate more operations in less time.

It supports a wide range of operations and offers multiple kinds of robots (attended, unattended, and hybrid) to accommodate an organization's demands despite the duties at hand (PeerSpot 2022f).

UiPath is built of many components. UiPath Studio is one of them; it uses visual aids like graphs and visualizations to develop automation. In addition, it applies the programming and ordering of such procedures; its graphical user interface comprises pre-built templates, interface buttons, and drag-and-drop capability. UiPath Robot is the subsequent component, and these robots are placed to perform operations automation according to established rules. UiPath Orchestrator is another component that works as a web-based service for scheduling, deploying, and managing activities.

5.3 Microsoft Power Automate

Microsoft Power Automate is a universal software system that interfaces with a large number of different services in a smooth manner. It was previously known as Power Automate, Microsoft Flow, MS Power Automate. This solution could save costs on simple activities utilizing Microsoft products. Microsoft charges if there are more than ten forms, and there is no cost to maintain if less than ten forms are used. Based on it, most companies can use this technology without paying anything extra. Office 365 licensing includes Microsoft Power Automate as part of the general license (PeerSpot 2022e).

It is equipped with API integration and orchestration features. Tool's provider offers comprehensive technologies inside the Power Platform, such as Power BI, Process Advisor, Power Apps, API connections, and Power Virtual Agents (Gartner 2021).

This API-orchestrated solution can combine numerous record systems to automate data transcribing tasks. Microsoft leverages all of the Power Platform components to build a single, unified, end-to-end platform that provides automation, integration, low-code application development, and analytics capabilities to fulfil companies' business process automation needs. Power Automate offers a robust connection with Microsoft's ecosystem of popular applications (Gartner 2021).

Microsoft’s RPA is dependent on Power Automate Desktop (PAD). It needs local installation on computers or virtual machines operating on the most recent version of

Windows and cannot be installed on any other operating system. PAD is offered free in Windows 10 and above versions. Also, there is a paid subscription that includes extra features (Gartner 2021).

5.4 Blue Prism

Blue Prism is the pioneer of the RPA industry, and it was launched in 2001 (Taulli 2020). Blue Prism is a clever, no-code automation tool for deployments of software as a service in on-premises, public cloud, multi-cloud, and hybrid infrastructures. This tool, unlike previous automation technologies, combines robotic process automation with increased artificial intelligence and cognitive capabilities. It offers users with immediate access to the tools necessary for constructing and deploying automation. Blue Prism brings better flexibility and productivity by making it simple to automate the most important activities (PeerSpot 2022c).

According to customer comments, Blue Prism excels in its enterprise-level capabilities. Users mention that the solution is user-friendly, stable, and scalable in a robust manner. It assists organizations with everything from compliance to quality control and mistake prevention (PeerSpot 2022c).

A summary of this tool's features includes the following (Arora, 2021):

- Multi-environment deployment model.
- Automated credential management.
- Audit trails.
- Process changes in comparison.
- Process configuration.
- Application automation.
- Central administrative console.
- User role settings.
- Reporting and analytics.
- Integrations.

5.5 Automation Anywhere

Automation Anywhere is one of the most popular RPA solutions. Intelligent software bots enable clients to automate end-to-end business operations. The firm provides a cloud-native and web-based automation platform that combines RPA, artificial intelligence, machine learning, and analytics with more security and scalability than traditional monolithic solutions. Automation Anywhere has delivered almost three million bots to

serve some of the world's leading organizations in more than ninety countries (PeerSpot 2022a).

The following is a list of highlights for Automation Anywhere (Arora 2021):

- Cognitive robots.
- Rules setting.
- Machine Learning.
- Administrative console.
- Analytics.
- Single Sign-On.
- Version control.
- Bank-Grade Security.
- Integrations.

5.6 Decision Matrix for Robotic Process Automation tools

This section provides a table 1 comparing the investigated Robotic Process Automation tools. In addition to the presence of criteria, we use the number of checkboxes within the scope of our study to demonstrate the compatibility of technology with the business.

The table 1 presents eight items demonstrating the relationship and comparison between four RPA solutions. We can observe that UiPath gained the most considerable number of ticks compared to the other tools, while Microsoft Power Automate has the second-highest score. For this comparison, we referred to users' feedback to these four tools on PeerSpot (PeerSpot 2022d).

In general, all tools have equivalent technical features needed for our research, even though UiPath has more options. One of the most important criteria was the cost of ownership. Because it is included with our Microsoft Office subscription, Microsoft Power Automate's main functionality is available at no additional cost, and in this phase, we do not need extra features. UiPath also provides free options for individuals and small teams. Based on feedback, the user experience for all these tools is fairly good, and some reviews mentioned that UiPath is more intuitive. Exception handling, support and reliability of the tools seem the same.

Table 1. Decision Matrix for Robotic Process Automation tools

Criteria	UiPath	Microsoft Power Automate	Blue Prism	Automation Anywhere
Technical features	✓✓	✓	✓	✓
Cost of ownership	✓✓*	✓✓✓*	✗	✗
Usability	✓✓	✓	✓	✓
Exception handling	✓	✓	✓	✓
Support	✓	✓	✓	✓
Reliability	✓	✓	✓	✓
Community	✓✓✓	✓	✓	✓✓
Longevity	✓✓✓	✓✓	✓✓	✓✓

UiPath has the most sizable number of users and a big community, there are a lot of forums, and it would be easier to find answers for common problems. All these tools have a good longevity record and a promising future as leaders in the RPA market.

5.7 Summary of the chapter

No surveys tried to evaluate and consolidate these four RPA instruments. In this part, we came to the point where we presented the most popular tools, and it is a moment to make a selection of the tool among them to be used for implementing a manual process in later chapters.

It is not easy to select since UiPath and Power Automate provide many valuable services and essential features. Although UiPath has more ticks in a table, the final decision came

to Power Automate. Power Automate was preferred over other tools since it goes for free as part of the current Office 365 subscription and allows us to save budget. This factor was one of the most essential for us. This tool provides excellent usability, and it has all of the features that we might need. Even though UiPath has the most significant community, the Microsoft product community is growing and seem highly active. At the same time, we have good support from the Microsoft side, which gives us an extra point to select Power Automate.

Microsoft's product also seems quite promising, and the number of users is growing fast every day, which bring us to the conclusion that it makes sense to invest efforts in this solution.

6 The selected manual process

The chapter aims to provide an automation proposal for one of the manual invoice handling processes in the finance and administration department. This chapter outlines the series of actions done as part of a business process, the variables, and rules of the process prior to automation, and how they are expected to function after delivering the finished RPA process. The outcome of the chapter serves as a base for the subsequent implementation chapter by giving the necessary specifications for deploying robotic automation to the defined business process.

6.1 Summary of the process

The process selected for RPA is part of the daily manual routine that the finance and administration clerks met in their work for organization "A".

The company "A" regularly provides many training sessions to their customers. It is organized for customers worldwide, and each training can have from five to up to sixty attendees. After such a session, the responsible person for the held session sends a Microsoft Excel document to the accounting clerk. The document contains attendees' information such as name, company, country, cost of the training, billing information, etc.

After receiving the document, accounting clerks process this file by manually filling the invoice generation form with relevant data for each attendee by grouping per company in fiscal management software called Procountor. Then, the clerk saves the filled invoice form and clicks on send button for the invoice to be paid.

This process has reasonable grounds to be examined and eventually automated. Successfully delivered automation will release accounting clerks from small routine tasks and let them distribute their time for more critical duties.

6.1.1 Benefits and objectives

Implementation of the proposed manual process can bring different qualitative benefits to the company:

- Increasing accounting clerk motivation by reducing a load of frustrating tasks.
- Allowing clerks to be more focused on important tasks.

At the same time, the clerk usually receives 1 to 3 emails per week with such excel documents with training attendees. The actual handling of one attendee takes around 6

minutes per company. The finance and administration can achieve the following quantitative objectives for savings:

- Automation can eliminate approximately 6 hours of routine work per week.

The main benefit of the actual implementation of RPA is that it opens gates for researching and finding more business processes to be automated. After adding RPA to the company as a widespread practice, even for a small task, it opens automation possibilities for other employees and the idea generation process is triggered.

6.1.2 Implementation notes

The implementation effort and the size of the work are derived from key attributes. In the table 2, it can be seen key attributes with their description and numbers which affect the efforts.

Table 2. Attributes and descriptions of the implementation of the automation

#	Attribute	Description
1	Inputs	The structure of receiving excel documents with attendees' information differs based on the person who sent it. Although, the accounting clerk can set the policy for training providers to bring such information to a general template since the main needed fields for invoice handling are the same. This template will be structured, and the position of the details will be fixed. Inputs in fiscal management software are always standard and structured and can be changed only with a version update of Procountor.
2	Number of screens	OS as starting screen – 1, Microsoft Outlook – 1, Microsoft Excel – 2, Procountor – 1, Total – 4.
3	Type of Applications	Windows 10 – operating system, Microsoft Outlook – email client,

		Microsoft Excel - spreadsheet software program, Procountor – fiscal management software.

In real-business life, several roles are involved during the implementation of automation. In this thesis, the author would wear most of the roles, and some of them by the accounting clerk and thesis supervisor.

For clarity in descriptions of phases, it will be mentioned expected actual business roles in brackets to be involved in automation because this thesis work can serve as a constructive guide for implementing RPA in a company, even though only three persons engaged in our study to implement the process.

First, implementation starts from a point where the author and supervisor of the thesis (Business Analyst and Implementation manager) prepare robotic process automation by defining business benefits and prioritizing the pipeline.

In the subsequent two phases, the author of the thesis takes the first phase and involves an accounting clerk in the second phase for having access to Procountor. First, the process goes to the solution design phase. The author (BA, QA, Solution Architect, and RDA developers) describes how to implement a technical solution to the project and prepares automation requirements. Next is the build RPA phase; in this step, the author and accounting clerk (the RDA developer, PO, and BA) develop automation based on previously written automation requirements.

In the test RPA phase, the author and accounting clerk (PO, RPA support, RDA developer, and BA) work on performing user acceptance testing (UAT), bug fixing, and testing.

After the previous step process moves to stabilize the RPA step, in this step, the process goes to production (IT, RPA Developer, and Architect), then production monitoring by the thesis author, supervisor, and accounting clerk (RPA support), and to measure the expected results with actual results by business analyst (BA).

In the final phase, only an accounting clerk is involved. This phase ensures constant improvement, where accounting clerks (BA, PM, and PO) perform performance assessments. At the same step, benefits tracking can be done by the thesis supervisor (PO) and managing changes can be performed by the author of the thesis (BA and the Implementation team).

6.1.3 Background data

In the table 3, it can be seen the general data about the proposed automation process.

Table 3. Items and descriptions of the proposed automation process

#	Item	Description
1	Short name	Invoice handling
2	Organizational level	Finance and administration department
3	Input data	An email with a special subject
4	Output data	Filled invoice sent to be paid.
5	Period of execution	Monday, 9 am – 10 am.
6	Average manual handling time per item (AHT)	6 minutes
7	Number of items processed during a normal period	~25
8	Peak period	Randomly
9	Number of items processed during peak period	>60
10	The expected increase of volume in the future	Hard to estimate since the increase in the number of customers will lead to an unexpected rise in the volume of attendees of training sessions in the future
11	Total Full-time-equivalent (FTE)	~0,15

6.2 Process overview

6.2.1 Applications used in the process

Table 4 includes a comprehensive list of all the applications that are used as part of the process to be automated, at various steps in the flow.

Table 4. List of applications used in the process

#	Application name	Language	Access method	Comments
1	MS Outlook	EN	Desktop application	Emails and data management
2	MS Excel	EN	Desktop application	Spreadsheet software program
3	Procountor	FI	Desktop application	Fiscal management software

6.2.2 High-level AS-IS process map

This chapter depicts the As-Is business process at a high level to enable developers to have a high-level understanding of the current process. Table 5 represents a simple high-level process diagram.

Table 5. High-level AS-IS process map with average handle time in minutes

Open Outlook		Read the email with a list of attendees		Download list of attendees		Open the file	
Outlook	➔	Outlook	➔	Outlook	➔	Windows 10	➔
0.5		1		0.2		0.3	

➔	Check the list of training attendees		Open Procountor		Fill the invoice form for the attendee		Click the send invoice button
	MS Excel	➔	Procountor	➔	Procountor	➔	Procountor
	0.3		0.5		3		0.2

6.3 Detailed AS-IS process description

6.3.1 AS-IS process map

This chapter illustrates the AS-IS process flowchart. Figure 8 represents a workflow diagram with data descriptions. A larger version of figure 8 is presented in Appendix 2.

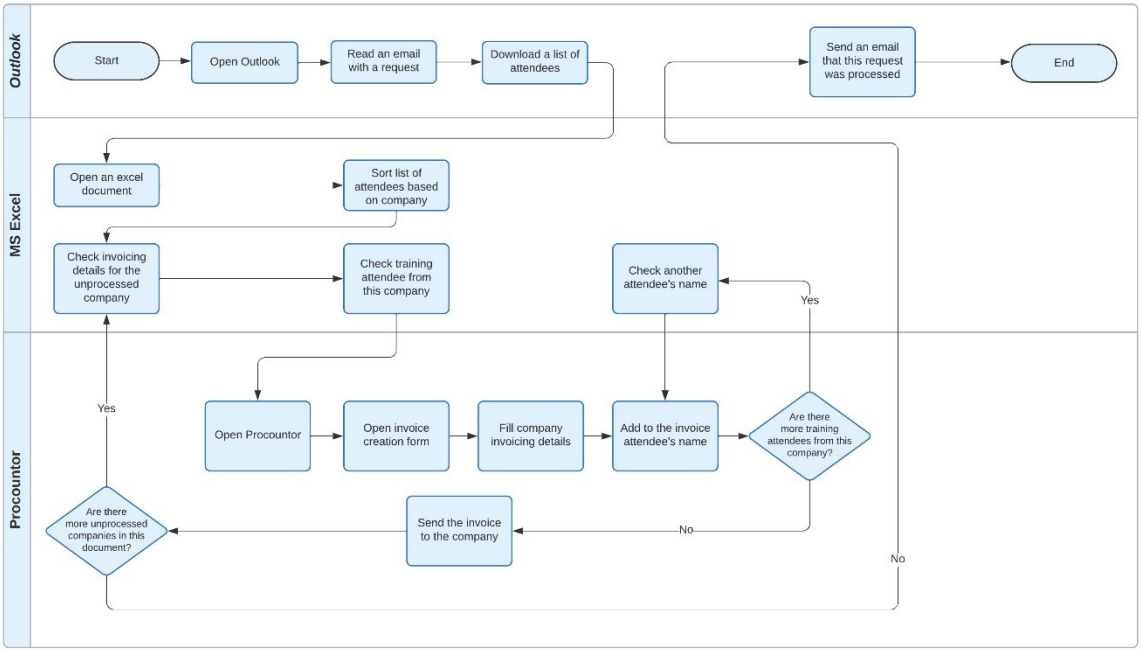


Figure 8. Detailed AS-IS process map

6.3.2 AS-IS process steps

Table 6 describes the steps used in the workflow process map with defining input data, description of the step, details, and output data.

Table 6. Numbered steps from the AS-IS process map

Step	Input data	Description of the step	Output data
1	Open Outlook	The user opens Outlook desktop version	Outlook desktop version was opened
2	Read an email with a request	The user opens the email with a request to create invoices	The user has read the email
3	Download the attachment of the list of attendees	The user clicks on “Save all Attachments” button	Excel document with list of attendees was downloaded
4	Open an excel document	The user opens the downloaded document	The document was open

5	Sort list of attendees based on company	The user sorts the provided list of attendees based on company	Document was sorted based on company
6	Check invoicing details for the company	The user reads the invoicing details of the company keeps it for later usage while filling the invoice creation form	The relevant company's data was read and kept.
7	Check training attendee from this company	The user reads attendee information, like name and keeps it for adding to the invoice creation form.	The relevant attendee's data was read and kept.
8	Open Procountor	The user opens Procountor desktop application	Procountor was open
10	Open invoice creation form	The user navigates to the invoice creation form	The invoice creation form was open
11	Fill company invoicing details	The user starts filling invoicing details of the company	The invoice creation form was filled with the company's invoicing details
12	Add to the filled invoice the company attendee's name	The user adds attendee's name to the filled invoice	The invoice was filled with the company's and user's details
13	Are there more training attendees from this company?	A condition that checks there are more training attendees from this company, which verifies another attendee's name and adds to the invoice as in	Condition is checked.

		Step 12; otherwise, it goes to the next step	
14	Send the invoice to the company	The user clicks on the send button for the invoice to be paid	The invoice was sent, and the creation form was closed
15	Are there more unprocessed companies in this document?	A condition that checks if there are no unprocessed companies then moves to the next step; otherwise, it goes to the step 6	Condition is checked.
16	Switch to Outlook	The user switches to Outlook desktop application	Outlook was open
17	Send an email that the request was processed	The user writes a reply email to the requestor that the invoices were sent to the companies of all attendees.	The employee received the email

6.3.3 AS-IS data descriptions

The following table represents the data items used in the workflow process map. Each data item is defined only once even though it is used as input data in many steps

Table 7. Data items from the workflow process map

Name of the data	Sample	Input source	Location	Standard (Yes/No)	Structured (Yes/No)
The email with a request	Standard email with the document file	Email	Unopened email in the Outlook	Yes	Yes
Excel document	Standard Excel sheet	Excel	'\Downloads' folder	Yes	Yes

with a list of attendees	with a list of attendees				
Procountor invoice creation form	Standard Procountor invoice creation form	Data from excel document	Installed desktop application	Yes	Yes

6.4 Detailed TO-BE process description

6.4.1 TO-BE process map

This chapter illustrates the TO-BE process map in figure 9, and in Appendix 3, a larger version of this figure can be found. We differentiate steps based on three colors. The blue color represents only manual steps that will not be automated and will always be performed by a human. In this phase of the research, it was decided to split the automation scope and focus on delivering minimum viable product (MVP), which is why we have green and red. As part of MVP, we would focus on implementing red-colored steps to be automated and leave green colors for future iterations to be done as a future improvement.

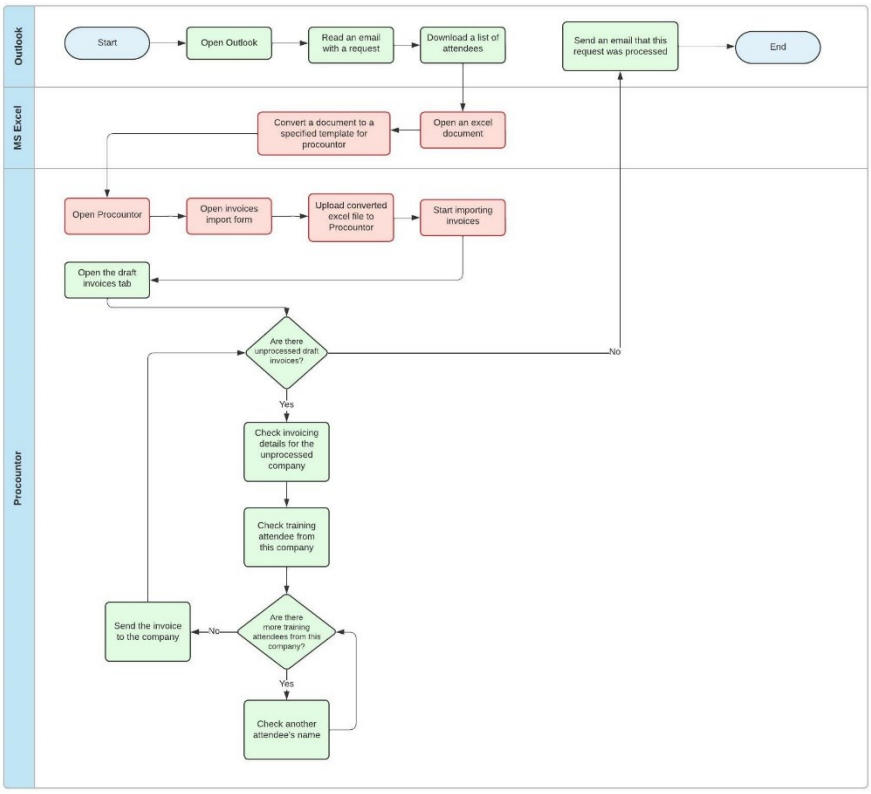


Figure 9. Detailed TO-BE process map

6.4.2 TO-BE process steps

The following table describes the steps used in the TO-BE process map with defining input data, description of the step, details, and output data.

Table 8. Numbered steps from the TO-BE process map

Step	Input data	Description of the step	Output data
1	Open Outlook	The user opens Outlook desktop version	Outlook desktop version was opened
2	Read an email with a request	The user opens the email with a request to create invoices	The user has read the email
3	Download the attachment of the list of attendees	The user clicks on “Save all Attachments” button	Excel document with list of attendees was downloaded

4	Open an excel document	RPA opens the downloaded document	The document was open
5	Convert a document to a specified template for Procountor	RPA converts the document based on an accepted Procountor template	The document was converted
6	Open Procountor	RPA opens Procountor desktop application	Procountor was open
7	Open invoices import form	RPA navigates to the invoice importing form	The invoice import form was open
8	Upload converted excel file to Procountor	RPA uploads converted excel file to Procountor	The document was uploaded
9	Start importing invoices	RPA clicks on the import button	Invoices were created based on converted documents and placed in the draft invoices tab
10	Open the draft invoices tab	The user opens the draft invoices tab	The draft invoices tab was open
11	Are there unprocessed draft invoices?	A condition that checks if the draft invoices tab is empty then moves to the end of execution; otherwise, it goes to the next step	Condition is checked.
12	Check invoicing details for the	The user reads the invoicing details of the company and verifies it with an initial excel document	Company details were verified

	unprocessed company.		
13	Check training attendee from this company	The user verifies attendee information from the company with an initial excel document.	Attendee details were verified
14	Are there more training attendees from this company?	A condition that checks there are more training attendees from this company, which verifies another attendee's name; otherwise, it goes to the next step	Condition is checked.
15	Send the invoice to the company	The user clicks on the send button for the invoice to be paid	The invoice was sent, and the draft form was closed. The flow goes to step 11. If there are no unprocessed draft invoices left. The user moves to MS Outlook.
16	Switch to Outlook	The user switches to Outlook desktop application	Outlook was open
17	Send an email that the request was processed	The user writes a reply email to the requestor that the invoices were sent to the companies of all attendees.	The requestor employee received the email

6.4.3 TO-BE data descriptions

The table 9 represents the data items used in the TO-BE process map. Each data item is defined only once even though it is used as input data in many steps

Table 9. Data items from the workflow process map

Name of the data	Sample	Input source	Location	Standard (Yes/No)	Structured (Yes/No)
The email with a request	Standard email with the document file	Email	Unopened email in the Outlook	Yes	Yes
Excel document with a list of attendees	Standard Excel sheet with a list of attendees	Excel	'\RPA\RawInvoices\' folder	Yes	Yes
Converted document for uploading to Procountor	Standard Excel sheet with a list of attendees	Excel	'\RPA\ConvertedUnprocessedInvoices\' folder	Yes	Yes
Procountor draft invoices form	Standard Procountor draft invoices form	Data from converted document	Installed desktop application	Yes	Yes

6.4.4 Business exception handling

In the detailed process map on figure 2, when the initial Excel file is converted to a predefined Procountor template, several business exceptions can happen that should be managed, in table 10 we listed these exceptions. The first exception can occur when conversion takes longer than the defined timeout, then the process should stop and throw an alert with a proper error message. The second exception can arise and throw the alert if RPA met not valid fields in the initial file while converting to the Procountor uploading

file. The third exception can happen if uploading the converted file has failed based on a predefined timeout, and then an alert should arise. Also, more business exceptions can be added after the production at the “Constant Improvement” step.

Table 10. Numbered business exceptions of the process

BE#	Step	Description	Input data	Actions
1	5	Conversion of initial document with list of attendees and all needed fields for invoicing based on Procountor template	Data retrieved from email with the request	If conversion takes longer than the defined timeout, then the process should stop and throw an alert with a proper error message
2	5	Same description as in BE 1	Same input data as in BE 1	RPA should validate fields in the initial document while converting to the Procountor uploading file; if validation fails, RPA should stop and throw an alert
3	8 and 9	Upload converted excel file to Procountor and importing invoices	Converted file	An alert should arise if uploading the converted file has failed based on a predefined timeout.

6.4.5 Reporting

In our case, reporting will be implemented as an alert pop-up with a successful message that the RPA script was executed successfully. On table 11 it can be found reporting items of the process.

Table 11. Reporting items of the process

R#	Report name	Frequency	Description	Report tool
1	Alert pop-up	Each execution	After each successful execution, RPA shows an alert pop-up with a message.	RPA tool built-in functionality

6.5 Acceptance testing

6.5.1 Normal test cases

Test case #1:

Description: Positive testing scenario.

Input data: We provide a dummy excel document with a list of training attendees where all fields are valid.

Expected result: We manually go to the draft invoices tab and check that invoices were created based on the data from the converted file and information in invoices corresponds to data in the initial file.

Operating instructions: The human should prepare an input file with a list of dummy attendees and then check the results manually.

Test case #2:

Description: Negative testing scenario.

Input data: We provide a dummy excel document with a list of training attendees where some mandatory fields are empty.

Expected result: The program should tell us as a message that that nth row has the wrong value in an input field.

Operating instructions: The human should just set the wrong input variables in the input file with a list of dummy attendees and then check that alert with an error message will be thrown.

6.5.2 Known business exception test cases

Test case #1:

BE#: Test business exception when the user provides a document with invalid input fields.

Input data: We provide a dummy excel document with a list of training attendees where some mandatory fields are empty.

Expected result: The program should tell us as a message that that nth row has the wrong value in an input field

Operating instructions: The human should just set the wrong input variables in the input file with a list of dummy attendees and then check that alert with an error message will be thrown.

6.6 Summary of the chapter

In this chapter of the thesis, it was selected the manual process, and we made an automation proposal for one of the manual invoice handling processes. We defined that we would focus on delivering the minimum viable product by selecting the most crucial steps for automation. We wrote a detailed process definitions document which will be used as a guide in the subsequent chapter of the RPA implementation phase.

7 Automation of the process

The chapter introduces the actual use of Power Automate Desktop. It describes general actions used in the implementation and shows in which use cases the implementor used these actions. Besides, that chapter gives a profound explanation of the implemented flow. The outcome of the chapter is made and delivered RPA flow to the accounting clerk. Also, it serves as the last chapter before the conclusion.

7.1 Introduction of Power Automate Desktop

Microsoft Power Automate allows building automation from start to finish using Power Automate flows. Building desktop flows is the first step in designing an RPA solution.

First, we go to Power Automate and sign in with the Microsoft account. After successfully signing in, we should select "My flows", "Install", and "Power Automate for Desktop", like it is shown in figure 10. It downloads the Power Automate for Desktop installation file.

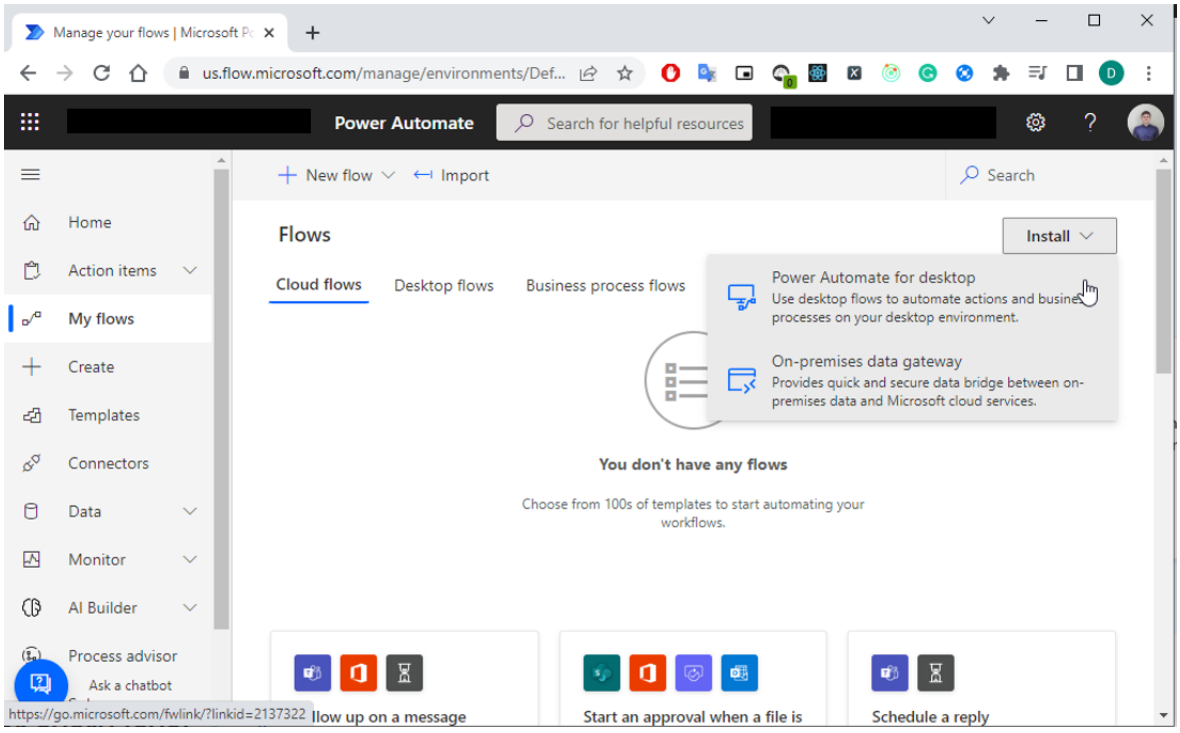


Figure 10. Manage your flows in Microsoft Power Automate

After downloading, we select the file and start the installation. In figure 10, after clicking the "Next" button on several installation screens and selecting the last checkbox, we install the tool. Besides installing Power Automate, it installs browser extensions for Google Chrome and Microsoft Edge for web-automation steps.

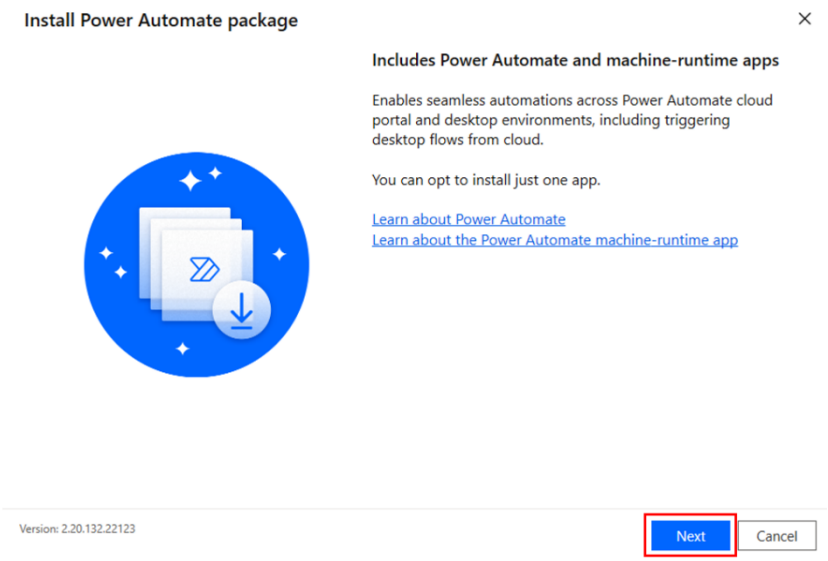


Figure 11. Install Power Automate package

After successful installation in figure 12, select the link of your preferred browser in the appeared window and enable the Power Automate extension in a browser. Then Power Automate desktop is ready to be launched.

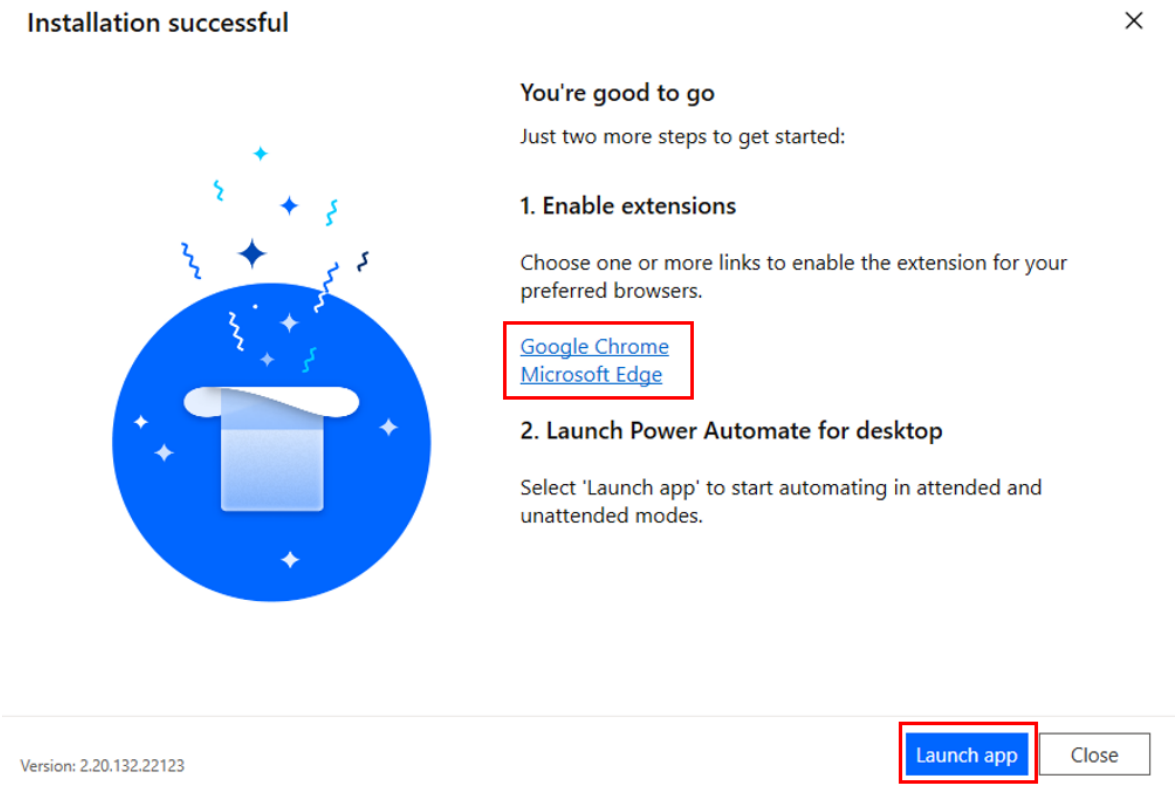


Figure 12. Installation successful of Power Automate Desktop

By that moment, we had downloaded the right software and had everything to create the first desktop flow. At this point, the primary duty is to become acquainted with the Power Automate Desktop.

First, we open and start exploring the app in figure 13. Under Flows, we can see created desktop flows, which have the functionality to edit, start, or delete these flows. We can explore how to create or edit a flow by clicking the "+ New flow" button in the upper-left corner.

Let us name this new flow to be "Training attendees invoicing". Then we click on the "Create" button.

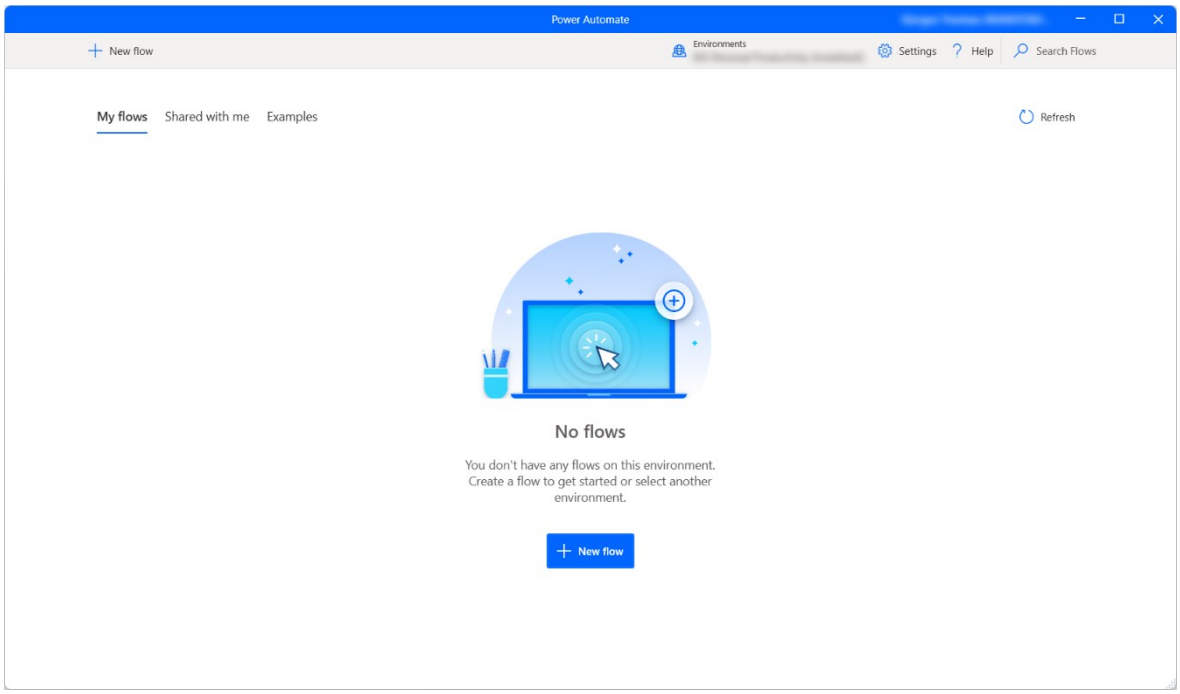


Figure 13. The main view in Power Automate Desktop

After creating a new flow, the Power Automate designer view will appear, like it is shown on figure 14. The view has several elements to be concentrated on:

- The toolbar contains basic actions such as "Save", "Undo", "Copy", "Paste", and "Debug". It also includes buttons to start the desktop and web recorders and control the implementation process by "Start", "Pause", or "Stop" buttons.
- "Subflows" button allows us to create subflows under the Main flow, which can be mentioned as a group within a desktop flow, similar to private methods in programming.
- The actions pane includes all Power Automate actions and a search bar that assists in finding specific actions by matching the action name to the typed words.
- The workspace contains all actions that have been added while implementing the automation process. These procedures are separated into tabs.

– The "Input/output variables" panel holds variables used in data exchange between cloud and desktop flows.
– The "Flow variables" panel lists all variables we created while implementing the automated process.

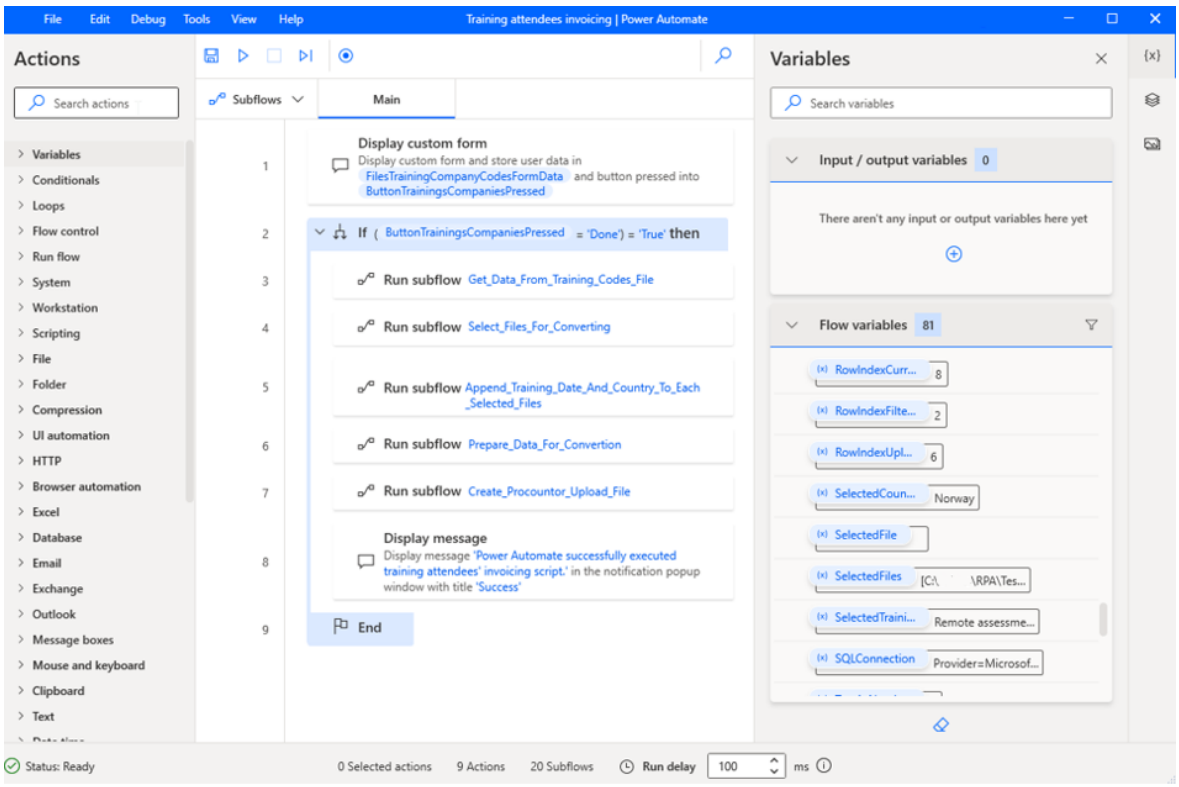


Figure 14. Power Automate designer menu

After clicking the "Save" button and closing the Flow designer window, we see a newly created flow with the name "Training attendees invoicing" in the list in figure 15. The accounting clerk will use this view for executing the developed RPA process by clicking the "Run" icon.

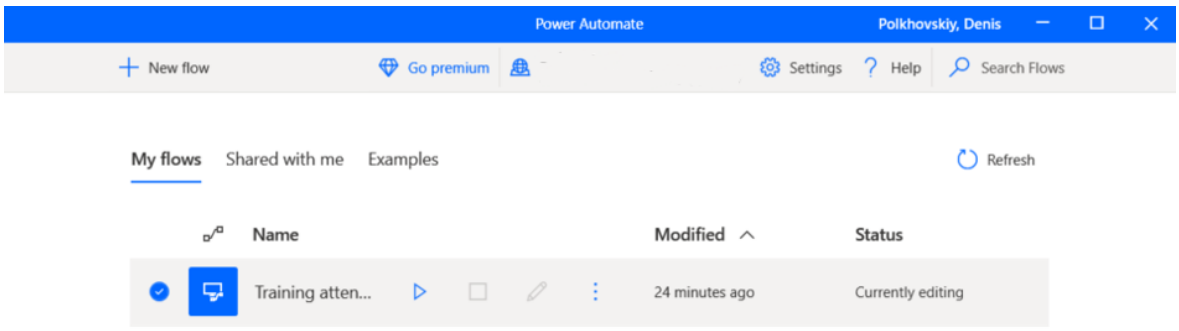


Figure 15. Main view with created flow in Power Automate Desktop

7.2 General actions

While the development phase, we used many actions provided by Power Automate Desktop. We used each of them many times to accomplish different use cases. In this subchapter, we would like to describe each action in order of appearance with one example of the use case without repetition of the same action, even if we used it for many other use cases.

The first action used in the flow is "Display custom form", which lies under the "Message boxes" category. By using this action, we can create a custom form shown in figure 16. This action has its custom form designer, which contains all different input elements. We can add text, date, and file inputs to our custom form. For making the form, we use a simple drag and drop technique. The inputted data is saved as one custom form object from which we can retrieve and use the information in our flow. In the first occurrence of this action, we created a form where we provide input files for fetching training and companies' data and radio buttons for specifying quantities of training attendees' files to be processed.

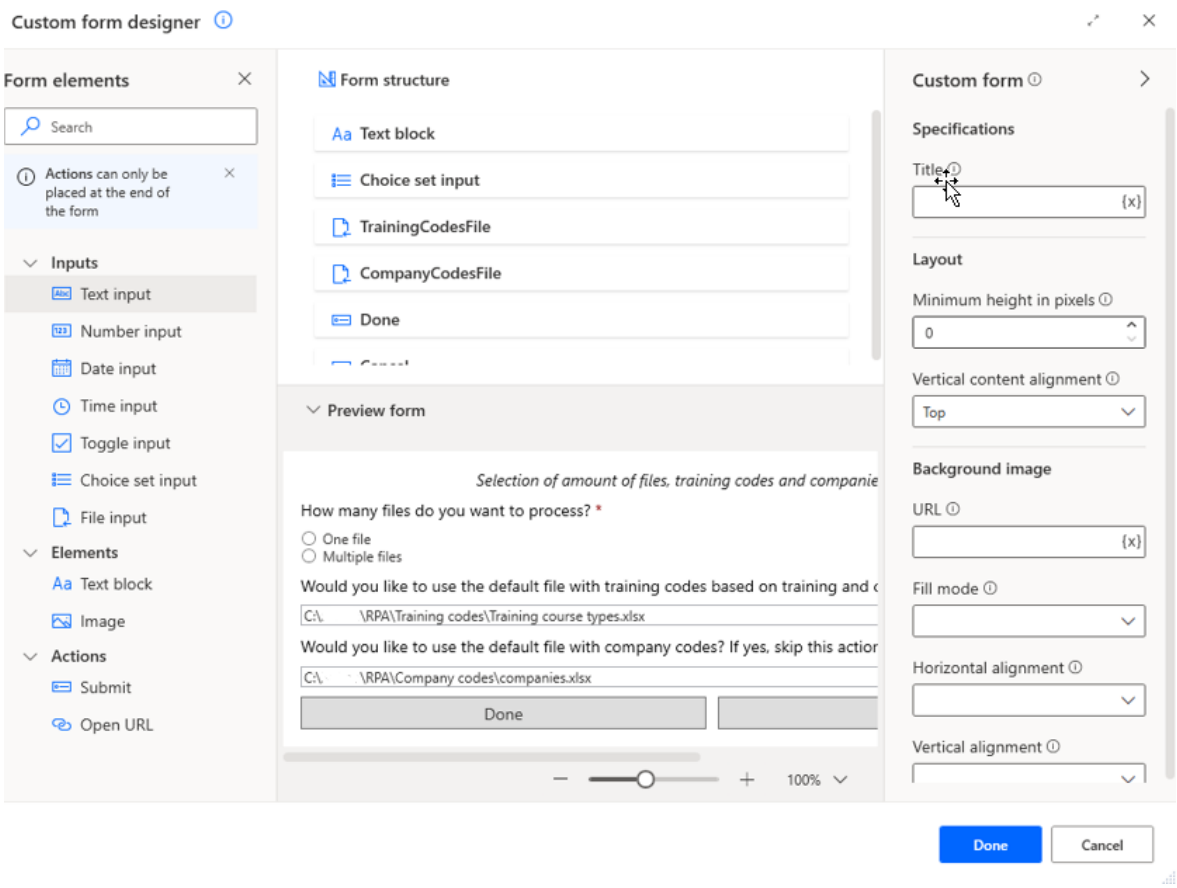


Figure 16. Custom form designer

Then, "Display message" and "Display input dialog" are used several times. Primary use cases were to notify the user about the flow state, like finishing or termination. When some data was missing, it was asked to input needed data in this dialog manually.

Once, we used the "Display select file dialog" when we selected the files, we wanted to transform into the upload file for creating draft invoices.

Next, commonly used actions are part of the conditionals category. We used all of them in the implemented flow. It includes "Case", "Default case", "Else", "Else if", "If" and "Switch". They allow us to execute blocks of actions only if a given condition is met. Example of “If” condition designer is shown in figure 17. If the condition is false, the automation flow will skip the block of actions. Using them, we can ensure certain elements have a wished value or state before performing other actions.

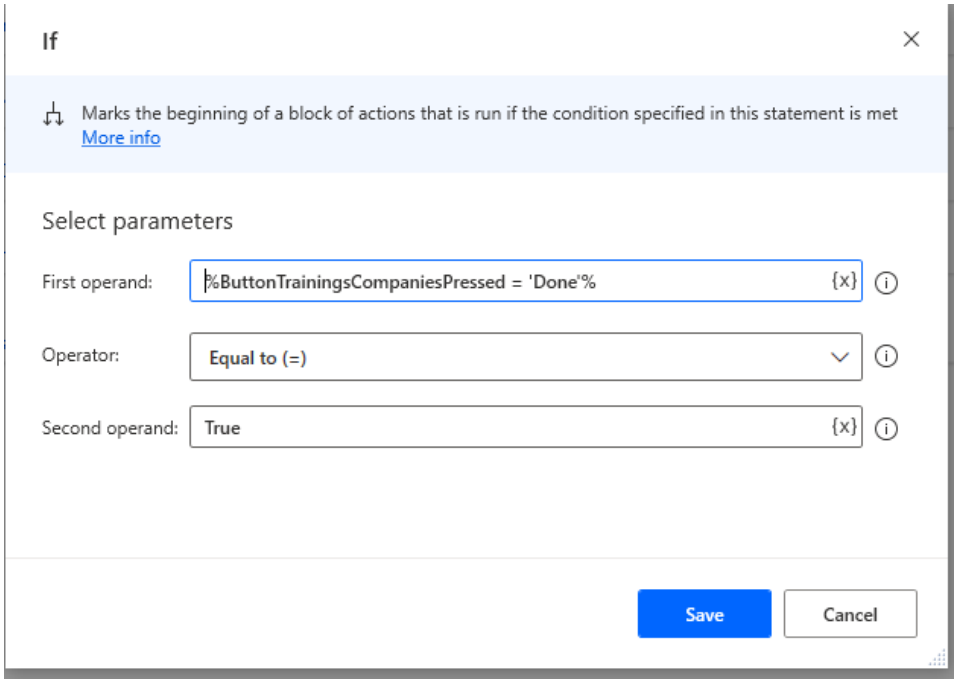


Figure 17. If condition designer

For example, in our flow, after showing the custom form, we check the produced variable of which button was pressed, and if the pressed button equals done, we execute actions inside the "If" block shown in figure 18.

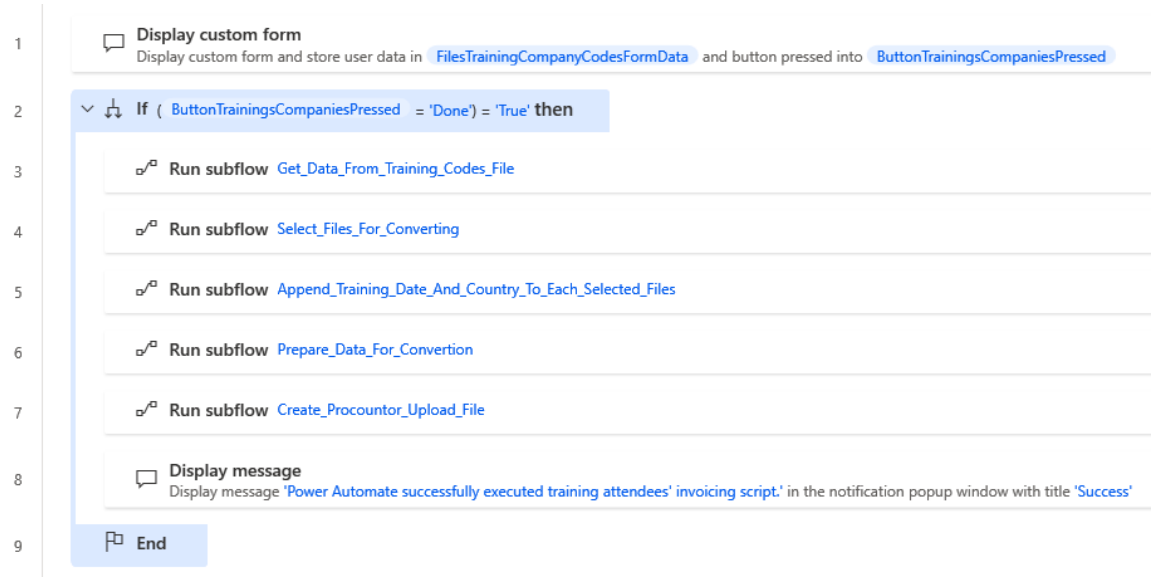


Figure 18. If condition block

Another commonly used action is "Run subflow". We used it to execute previously created subflows to split the code and make it more readable.

Within flows, variables are utilized to store data for future processing. Each variable's name must be surrounded by per cent marks (%) like it is represented in figure 19. The percentage symbol is utilized to express variables as a special character.

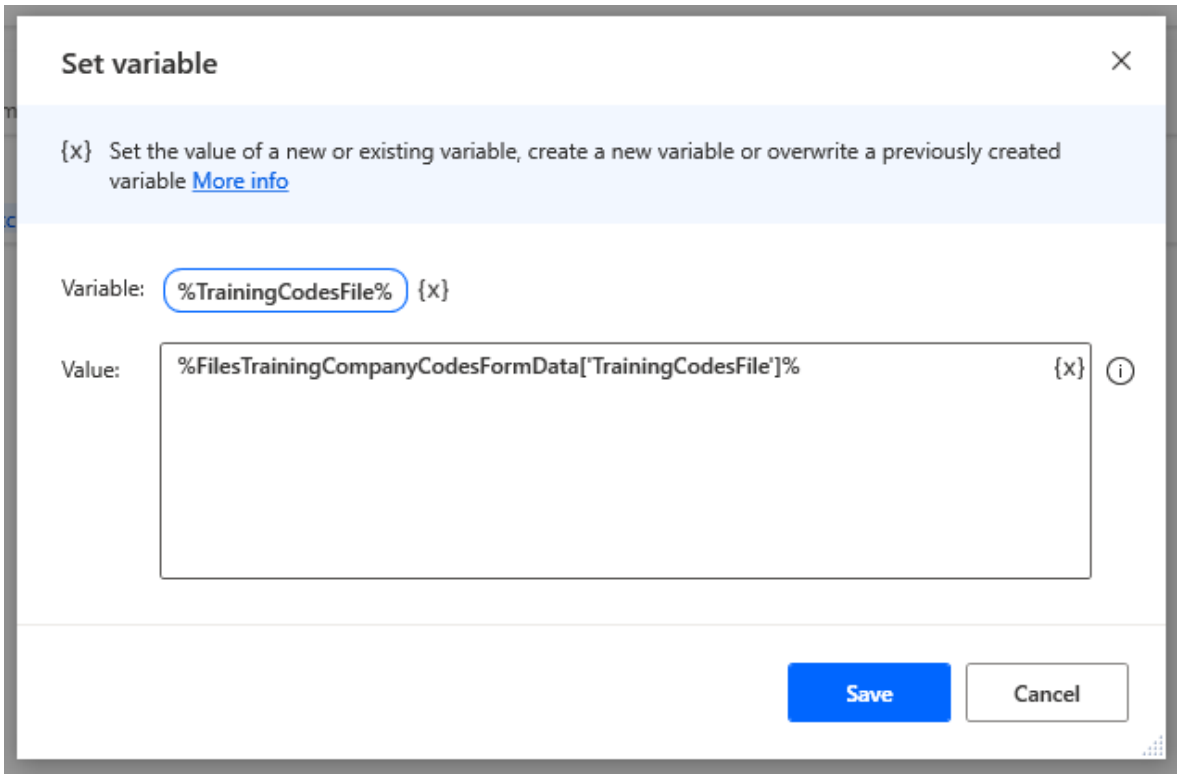


Figure 19. Set variable window

Power Automate permits the construction of complicated expressions with hardcoded variables, lists, variable names, arithmetic and logical procedures, comparisons, and parentheses.

Another essential part of the flow is Excel actions. After setting an Excel instance with the Launch Excel action, we read from an Excel file. We use the Read from Excel worksheet action to read and extract data from an Excel document. Retrieve the value of a single cell or a table of data. When the flow runs, the action stores the data in a data table type variable.

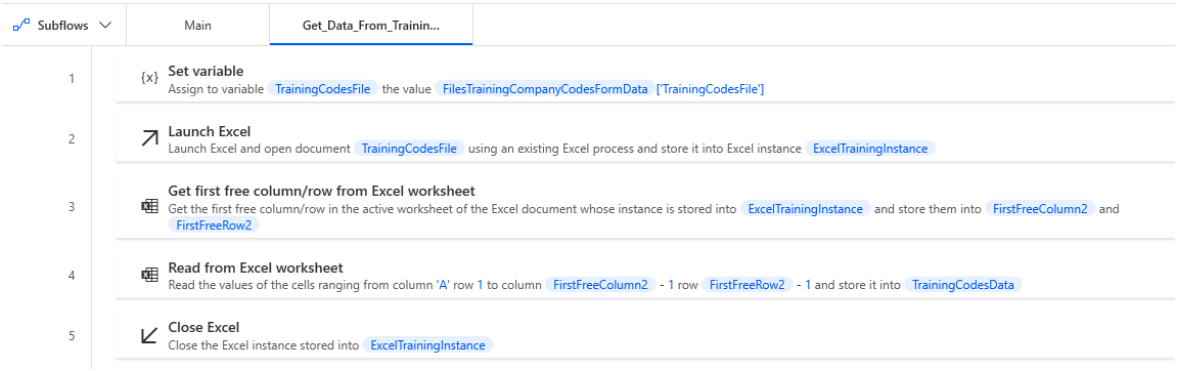


Figure 20. Excel actions

In figure 20, flow opens excel, reads data from the opened file, saves it in the data table with the name TrainingCodesData and closes the Excel instance.

Another important actions worth mentioning are loops. They automate repetitive sections of a flow by executing a block of actions multiple times. Loops are a fundamental concept in desktop flow development and are invaluable in complex flows. The main idea behind a loop is to make a desktop flow repeat one or more actions multiple times. Power Automate includes three separate loops that cycle according to various conditions; we utilized them in our workflow. Simple loops run a predetermined number of times. Conditional iteration when a condition is valid. For each iteration, we iterate over a list.

In figure 21, we iterate through selected files for transforming and performing predefined operations with each selected file.

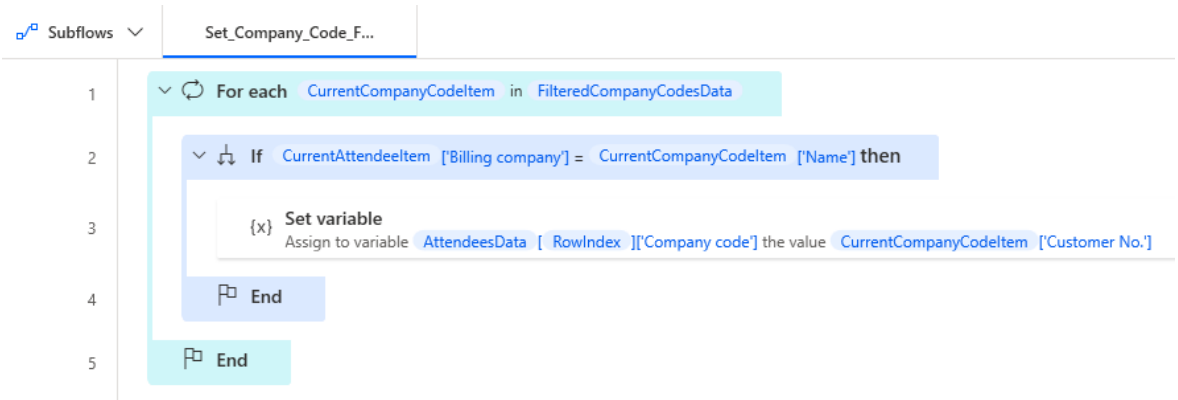


Figure 21. For each loop

While working on automation, was met a problem with the slow handling of companies while fetching company codes. Because the file with these data contains over two thousand rows of records, we had to start using Database actions instead of loops for reading companies' data to address this problem and improve the flow performance. These actions include an opening, executing, and closing SQL connection.

By introducing these actions, while transforming ten lists of attendees with twenty attendees in each file, the execution time was fifteen times faster than implementation with loops for finding company codes.

7.3 RPA process overview

In this subchapter, we would like to focus more on a process overview from a user interaction perspective than a code development site. The actual code and solutions applied in the script development can be observed in Appendix 1.

The first step for triggering the implemented RPA process is to open Power automate. This window in figure 22 presents all implemented RPA flows from which we can run or edit them.

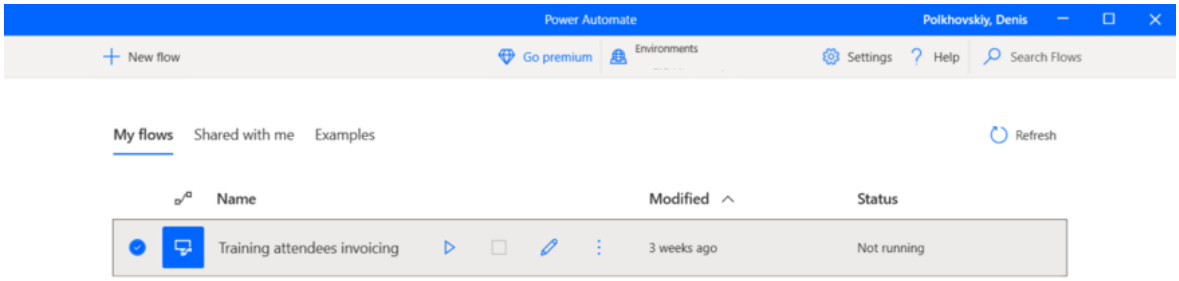


Figure 22. Main view in Power Automate

Next step, we click on the run button and the flow starts. Power Automate notifies us in right bottom corner in figure 23 that the flow has started, and we can pause or stop the process through this window.

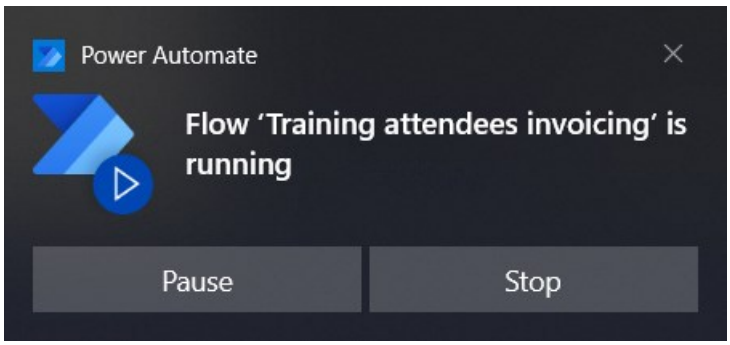


Figure 23. Power Automate notification window

The first step in the flow is to select the amount of files, training codes and companies' codes which are shown in figure 24. We must choose the number of files in data preparation since the flow adds training and company codes for each file. In our example, let us select multiple files.

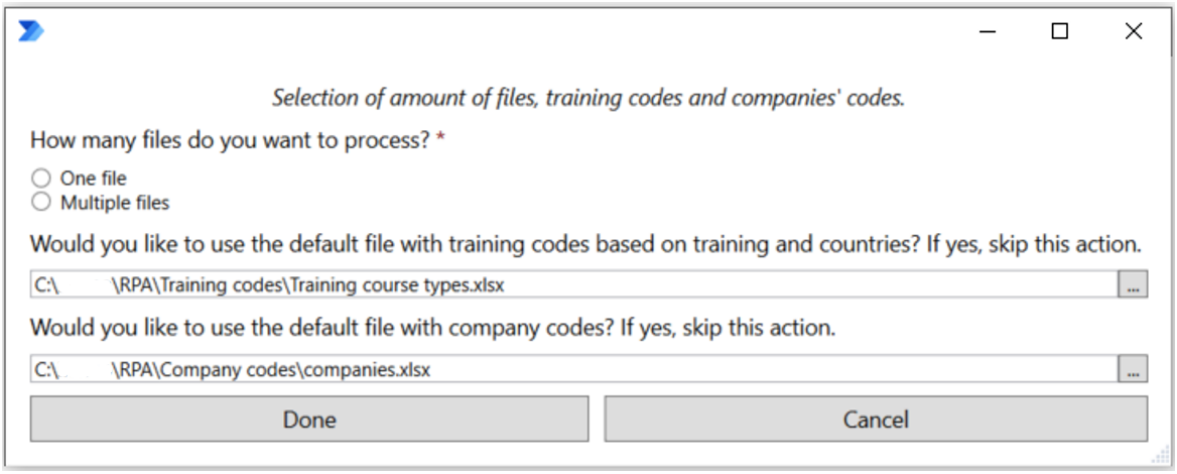


Figure 24. Training attendees invoicing first window.

Next, a file selection upload pop-up appears in figure 25, and it asks us to select multiple files.

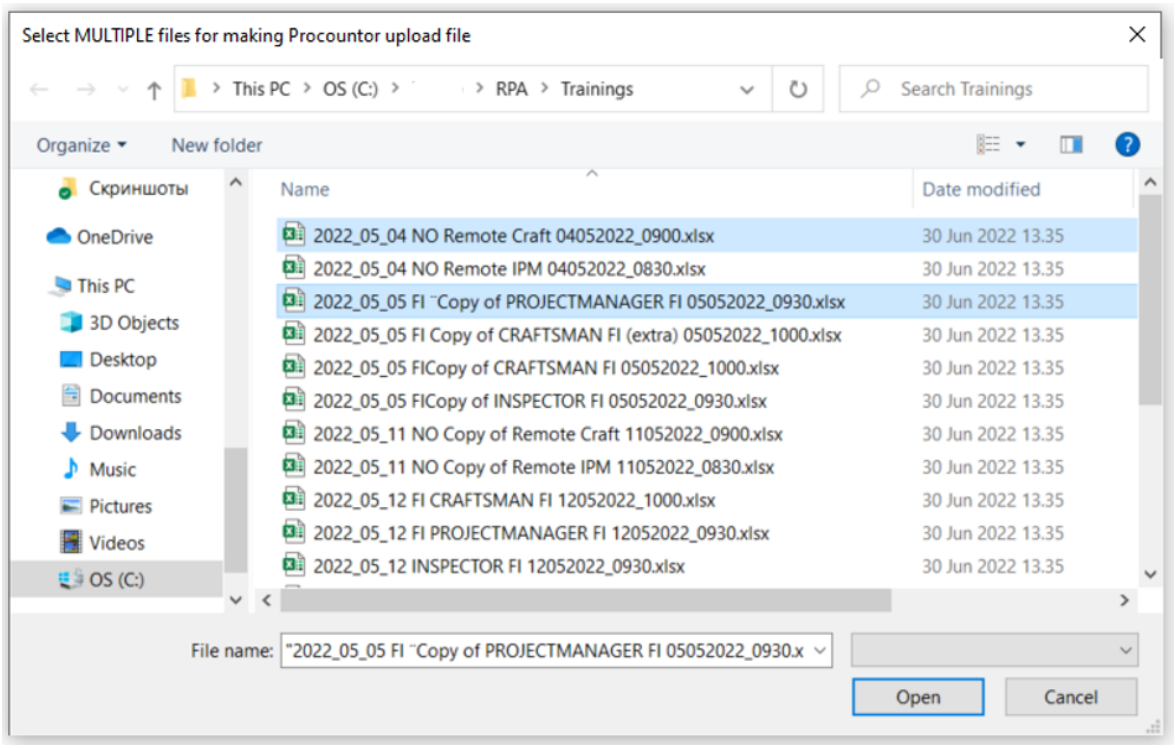


Figure 25. Files selection

Next, it asks us for each selected file to specify which type of training it was in figure 26, and if the flow could not recognize by itself the training date and country, it would leave empty fields for it, and we will need to fill it.

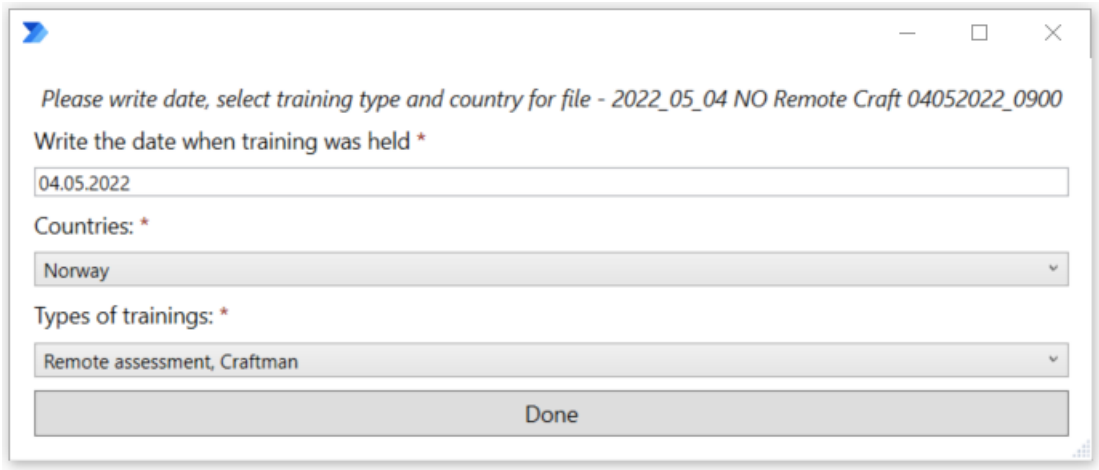


Figure 26. Date, country, and training type selection window

If the flow meets problems while finding company code, it will show the window selecting the closest company code or suggest typing company code manually for a troubling company in figure 27.

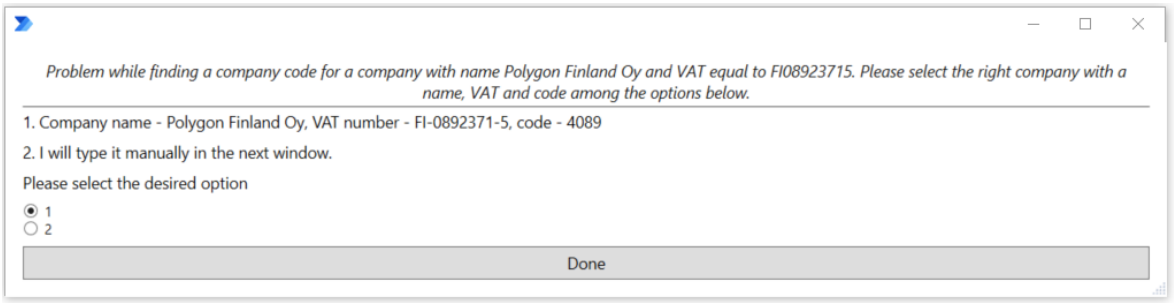


Figure 27. Company code exception handling

In the end, the flow will notify us that script was successfully executed in figure 28. After it, we can go to the predefined output folder and use the generated transformed file with all attendees for uploading to Procountor and creating draft invoices for sending to customers.

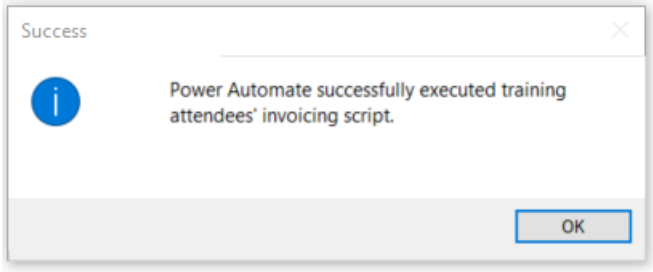


Figure 28. Success notification window

7.4 Summary of the chapter

In the implementation phase, we met several problems. The first problem was that the prepared documentation missed several specifications uncovered while developing the flow and was written without proper knowledge of Power Automate and development efforts. It was one of the reasons we decided to deliver a minimum viable product and left only part with transforming raw data to uploading document file based on the Procountor. An accounting clerk can manually upload since it takes one minute to do this. At the same time, the actual automation of uploading can delay the delivery of the flow, and we can do it in the following development iterations.

The second problem was that not all scenarios of exception points were taken while working on the process definition document. For example, we have not thought that there were two thousand companies and codes for them, and this information is missing in an initial file. We need to fetch it from separate sources. For example, the name of a company used in the default file cannot be fully matched to one in the company's file or having several companies with the same name but for different markets. We also had to

spend the effort optimizing script and working on performance while fetching companies' codes and using queries to oversee this problem.

There is more scope for further improvements, but the main part was done and can be used by the clerk daily. Another crucial point is that we set the RPA practice in a company. Now we have ready-made solutions that can be applied to implementing new flows to automate manual routines. We did the most challenging part, and the further process will be more straightforward with the next RPA scripts.

8 Discussion

As stated in the first chapter, this thesis aims to trigger the use of RPA within the organization for handling manual tasks. To reach this goal, we surveyed manual processes in the accounting department for automation. We created detailed development specifications with test cases; after that, we researched RPA tools on the market and selected the tool to be used. We automated the selected manual process based on written specs, and as the last step, we delivered an automated flow to the accounting department.

After reading a thesis, we expect the survey results to help readers comprehend the steps we took to establish RPA practice in a company. We feel that we researched the latest RPA tools on the market and utilized the best available sources.

The thesis gives clear answers for the first two sub-questions. Nevertheless, we cannot answer straight about the effects of RPA on the work process after implementation because it will take time before the process will be fully used and adjusted. Still, we can easily ensure that by that moment, time spent by the clerk is reduced from ten hours to one hour for overseeing the automated selected manual process.

In a thesis, if we consider the reliability of our findings, it is worth mentioning that we used constructive research with qualitative and quantitative research techniques. When we tried to find the manual process for robotic process automation, we relied on qualitative research methods by collecting the data from the most involved and aware respondents about finance and accounting processes in a company. It was used several interview methods. First, we started with the semi-structured interview, then used an open-ended interview, then a focus group interview and finally, we had a brainstorming session. Although, when we moved to the RPA tools chapter, we relied on dozens of reviews and feedback from the RPA community to define the best RPA tool, so this part we accomplished with the help of quantitative research methods. The results of the thesis work can be considered trustworthy because if similar research is conducted under identical conditions and for a comparative accounting process and the company with the same Microsoft subscription, the results will be the same.

Regarding the validity of the results, we can state that our findings are accurate to the current company situation and the methods used in a thesis with data were reliable because of collecting data from trustful sources.

Considering the ethical viewpoints, we can state that in the research, we tried to pursue high moral standards and do the work honestly and carefully, aiming for the results to be helpful. During the research process, we explained to all involved people the actual goals of the research and their roles in the study. We kept all answers anonymous and emerged conclusions based on interviewed persons will. Also, we can ensure that we did not falsify or mispresent the results of the study to make the desired or polished findings and conclusions. We did our best by mentioning and citing all articles, web sources or someone's texts in the thesis.

This thesis has demonstrated that further research in this area has considerable potential. During research for a thesis, countless ideas evolved. For example, in subsequent iterations of RPA improvements, we can finish Procountor uploading side automation; then, as part of the next iteration, we can automate manual validation of draft invoices created after uploading the file.

As an author, I can say that the thesis process was challenging. Even though it went smoothly, I always had thoughts and ideas about what to write. I had continuous support and interest in the topic in all phases of the thesis process from my thesis supervisors and all involved persons. I felt burned out before starting a thesis in the summer of 2021 when I completed most of the studies within seven months with a full-time job at the same time, so it was hard to push myself to write the thesis at the same pace as I passed courses in the MBA program. But slowly and step by step, I was able to finish the thesis work but failed the initial very optimistic planned schedule to complete a thesis within five months.

In the early phases of the thesis, it was hard to define the write scope of the objectives and main research question because, at that moment, I had a broad thought without having clear expectations and goals for a thesis. Although I successfully set them and followed research questions by trying to answer them throughout the whole thesis process. In the next stage of the thesis process, it helped me a lot that I covered the applied design research course, which uncovered the proper research methods which should be used in this study and showed me how to conduct the research.

While working on a thesis, I could apply the knowledge I gained in several courses in the MBA program. I also surveyed several RPA tools and learned how to write automation in Microsoft Power Automate. There is a belief that no coding is required to start working with RPA. However, my programming background has helped me a lot and reduced a time in the learning curve while gaining this knowledge because the same patterns and logic are applied while working on RPA.

In conclusion, this survey provides a deep dive into RPA technology; therefore, it might be valuable for people seeking a guide that complements a foundational understanding of automation for getting started. This research enables the reader to get familiar with what RPA is, how to define manual tasks, meet with the newest popular tools, and briefly introduce the coding of the RPA flow without wasting time on redundant information.

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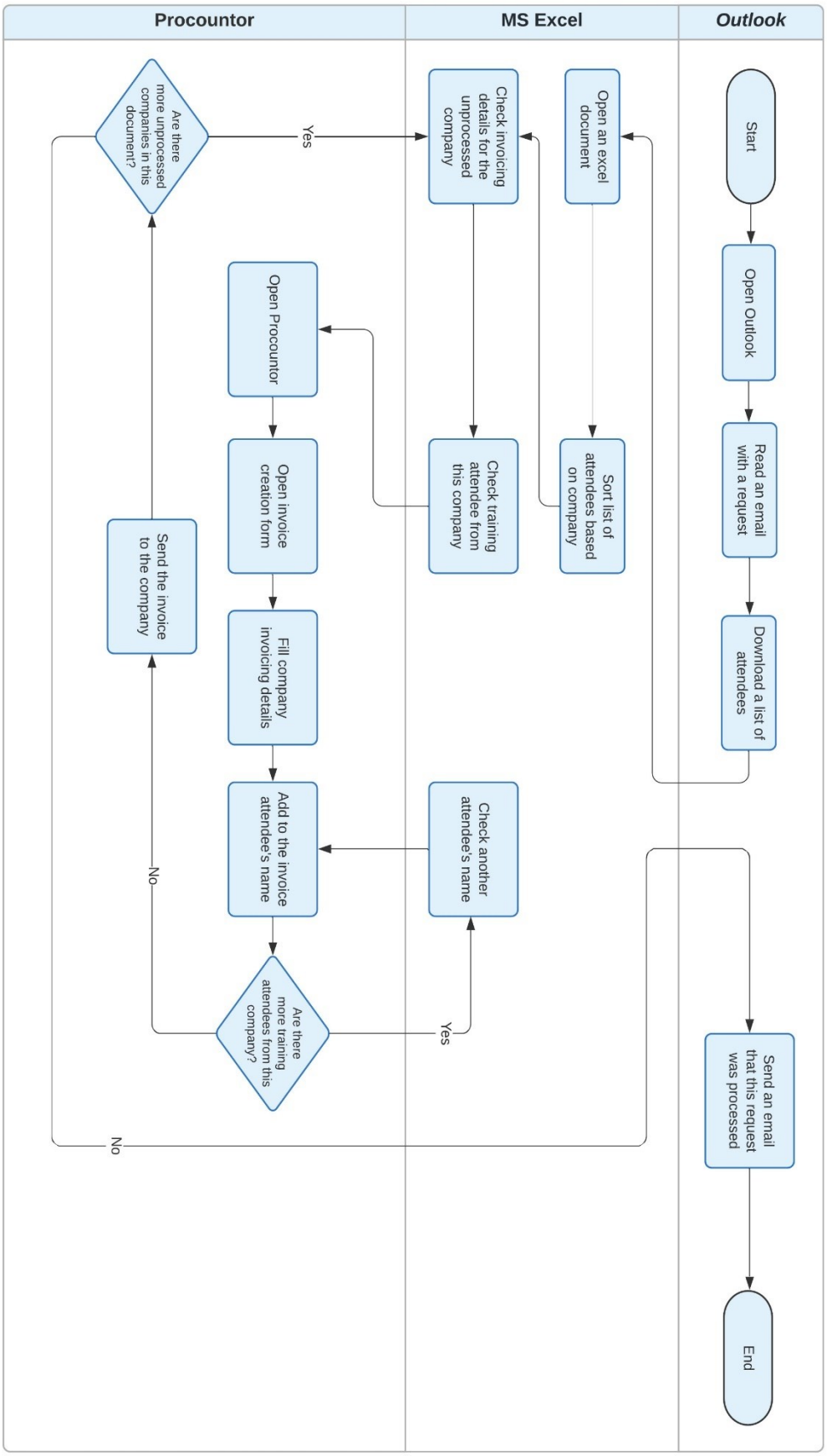
Appendices

Appendix 1. Extract of implemented main RPA flow source code

```
@@statistics_TextBlock: '1'
@@statistics_Input_ChoiceSet: '1'
@@statistics_Input_File: '2'
@@statistics_Action_Submit: '2'
Display.ShowCustomDialog CardTemplateJson: '''{
 \"type\": \"AdaptiveCard\",
 \"version\": \"1.4\",
 \"id\": \"AdaptiveCard\",
 \"body\": [
  {
   \"type\": \"TextBlock\",
   \"id\": \"Text block\",
   \"color\": \"dark\",
   \"italic\": true,
   \"text\": \"${Text_block_Text}\",
   \"horizontalAlignment\": \"center\",
   \"maxLines\": 3
  },
  {
   \"type\": \"Input.ChoiceSet\",
   \"id\": \"Choice set input\",
   \"style\": \"expanded\",
   \"isMultiSelect\": false,
   \"choices\": [
    {
     \"title\": \"One file\",
     \"value\": \"One file\"
    },
    {
     \"title\": \"Multiple files\",
     \"value\": \"Multiple files\"
```

Appendix 2. Detailed AS-IS process map



Appendix 3. Detailed TO-BE process map